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TAHANY R. NAGGAR

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THE ROLE OF THE IRON, COPPER, LEAD, AND PETROLEUM EXPORT SECTORS IN THE ECONOMIC DEVELOPMENT OF BRAZIL, CHILE, MEXICO, AND VENEZUELA: AN EMPIRICAL MACROECONOMIC ANALYSIS

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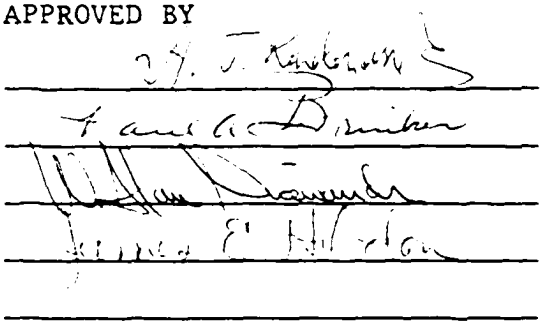

DISSERTATION COMMITTEE

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CHAPTER I

INTRODUCTION

Economic theory has made several attempts to explain the role of natural resources in the process of the economics of the less developed countries.[1] One view which relies on the classical theory that natural resources were the essential prerequisite for economic growth is best described by J. Spengler as follows:

> This endowment not only sets limits to what a people may accomplish at any particular time, given its technology, commercial relations, etc.; it helps a people's

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[1] E. Ulman, "Regional Development and the Geography of Concentration," Proceedings of Regional Sciences Association 4 (1958): 179-199. Also J. Dales, "Fuel, Power, and Industrial Development in Central Canada," American Economic Review Papers and Proceedings 43 (May 1953): 181-198. Also W. Dean, Jr., The Theory of Geographic Location of Economic Activities (Ann Arbor, Mich.: Edwards Brothers, 1938), pp. 24-28.

> culture and thereby conditions its future behavior, economic and otherwise.[2]

Another school of thought, however, asserts that natural resources play only a modest role in the economic development of the less developed countries. This role of natural resources is described by John H. Adler as follows:

> The complex process of development is sometimes influenced, but never decisively swayed by resources. Whatever the primary forces determining the speed and direction of economic growth may be, it would be wrong to count natural resources among them.[3]

The validity and relevance of these economic theories can be understood only if sufficient data were collected and some attempt is made to process this data through the use of statistical models.

The fact is that many less developed countries especially in Latin America are known for the rich availability of natural resources. However, most countries in Latin America are at widely different stages of economic development ranging from very poor, simple economies to relatively complicated ones, though none so advanced as North America or Western Europe. The production of metals and petroleum

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[2]J. Spengler, ed., "Summary, Synthesis and Interpretation," Natural Resources and Economic Growth, Papers presented at a conference held at Ann Arbor, Michigan, April 7-9, 1960 (Washington, D.C.: Resources for the Future, Inc., 1961), p. 295.

[3]John H. Adler, "Charges in the Role of Resources at Different Stages of Economic Development," in Natural Resources and Economic Growth, ed. J. Spengler, p. 69.

has probably been the area in which Latin America has made most impact on the economy of the world in the last four centuries.[4] The Latin American countries which produce approximately five per cent or more of the world production of iron, copper, lead and petroleum are Brazil, Chile, Mexico and Venezuela, respectively.[5]

Iron is rapidly becoming the basis of industrialization in Brazil.[6] Plans are already underway for major extensions to existing capacity, for development of new mines and for the completion of associated transport facilities of export tonnage in Brazil.[7] In the world economy, copper is the third most often used metal. Copper also has considerable political weight on the world scale, because of its strategic importance to industrial nations and because much of it is produced in less developed nations where economic and political influence can subject supplies to large fluctuations. In Chile, copper is a paramount long standing political issue. The world mining

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[4]J. P. Cole, Latin America (London, England: Butterworth and Co., 1965), p. 187.

[5]The production of oil in Venezuela according to the Minerals Yearbook of 1970 was 8.45% of the oil world production. The metal producing countries according to the same reference are Chile, producer of 11.81% of the world copper; Brazil, producer of 5.25% of the world production of iron; and Mexico producer of 4.75% of the world production of lead.

[6]J. P. Cole, Latin America, p. 344.

[7]G. Manners, The Geography of Energy (London: Hutchinson, 1964), p. 309.

capacity since 1964 has grown more rapidly than consumption leading to a surplus.[8] As for Mexico, by 1913, it had become the world's fourth largest lead producer and during the 1920's it became second after the United States.[9] The world requirements for lead over the period 1960-2000 have been estimated as approximately 130 million tons of lead while reserves as of 1965 were only 50 million tons.[10]

The worldwide industries are increasingly dependent upon oil and metals for their daily production. World consumption of petroleum outside the Communist countries is expected to reach some 1800 to 2000 million tons by 1975.[11] Venezuela is distinct from the other Latin American countries on account of its oil industry. Four decades ago it was among the poorer and less progressive countries of Latin America with most of its population confined to a small part of the national area and very heavily dependent on agriculture. Today, oil exports provide not only a large share of national income but also a substantial amount of its foreign exchange earnings. Oil represents a great asset which could potentially provide all the capital necessary for economic development.

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[8] J. Grunwald and Philip Musgrove, Natural Resources in Latin American Development (Baltimore: John Hopkins Press, 1970), p. 197.

[9] Ibid., p. 217.

[10] Ibid., p. 219.

[11] Ibid., p. 269.

Statement of the Problem

Many less developed countries face the problem of economic development with little or no economic research orientation. A number of institutions now try to provide this economic assistance through the formulation of national economic planning and the funding of economic research. Notwithstanding this effort much remains to be learned concerning the likely impact of natural resources via trade on development. The problem is fairly expressed by Gerald Meier's quotation that for some nations

> . . . the basic international trade problem . . . is not so much how to control its trade, but rather to achieve a more extensive carry over from its export trade to its domestic economy.[12]

Because a number of Latin American countries furnish superb research examples for purposes of testing the validity or applicability of economic theories, it is the purpose of this investigation to determine the impact of international trade upon the economic development of the less developed countries with particular reference to Brazil, Chile, Mexico, and Venezuela. In order to accomplish this purpose, two macroeconomic models will be used, these models are:

The Direct Impact Model which consists of

$$Y_i = a_i + b_iX \qquad (i = 1,2, \ldots, 10)$$

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[12]Gerald Meier, International Trade and Development (New York: Harper and Row, 1963), p. 159.

where: Y_1 = Private Consumption

Y_2 = Government Consumption

Y_3 = Investment

Y_4 = Total Imports

Y_5 = Exports of Non-Mineral

Y_6 = Direct Taxes

Y_7 = Indirect Taxes

Y_8 = Defense

Y_9 = Education

Y_{10}= Social Services Including Health

X = Iron, Copper, Lead, or Petroleum Export

The Indirect Impact Model which consists of

$Y_1 = a + b_1$ Disposable Income $+ b_2X$

$Y_2 = a + b_1$ Total Taxes $+ b_2X$

$Y_3 = a + b_1$ Income $_{t-1} + b_2X$

$Y_4 = a + b_1$ Income $+ b_2X$

$Y_5 = a + b_1$ Value of Non-Export Sector $+ b_2X$

$Y_6 = a + b_1$ Income $+ b_2X$

$Y_7 = a + b_1$ Total Imports $+ b_2X$

$Y_8 = a + b_1$ Population $+ b_2X$

$Y_9 = a + b_1$ Population $+ b_2X$

$Y_{10} = a + b_1$ Population $+ b_2X$

$Y_{11} = a + b_1$ Investment$_{t-1} + b_2X$

where: Y_{11}= Value of Non-Export Sector

Hypotheses

This study undertakes to investigate the following hypotheses on the bases of the preceding models:

1. There is no positive direct impact of iron, copper, lead, and petroleum exports on the Brazilian, Chilean, Mexican, and Venezuelan economy with regards to the variables previously mentioned, during the period 1950-1971.
2. There is no positive indirect impact of iron, copper, lead, and petroleum exports on the Brazilian, Chilean, Mexican, and Venezuelan economy with regards to the variables previously mentioned, during the period 1950-1971.
3. There is no unique significant indirect impact of iron, copper, lead and petroleum exports on the macroeconomic endogenous variables in the presence of a second exogenous variable in Brazil, Chile, Mexico, and Venezuela.

Scope of the Study

The Latin American countries were chosen to limit the number of the less developed countries. To further limit the scope of this study, the countries which produced approximately five percent or more of the world production of minerals according to the Minerals Yearbook of 1970 were chosen. Another limitation was the availability of data.

Thus, those countries which had available data and which produced approximately five percent or more of the world production of the specified minerals and petroleum were Brazil, Chile, Mexico and Venezuela as producers of iron, copper, lead and petroleum, respectively. The period covered in this study will be 1950-1971.

The macroeconomic models were limited to the basic components of aggregate demand. They do not include the labor market nor the money market. The models do not consider the economic capacity to meet the desired aggregate demand. The indirect model includes an equation of the aggregate production function as well, i.e., the value of the non-export sector. The models are static models of the Keynesian variety.

Methodology

The methodology of the study includes both a descriptive and a statistical approach. The descriptive method will be used to review some of the major economic problems that exist in Latin America and specifically those which pertain to Brazil, Chile, Mexico and Venezuela. Statistical methods will be used to analyze the direct impact of the iron, copper, lead, and petroleum exports on the Brazilan, Chilean, Mexican and Venezuelan economies by using a simple regression technique. The estimated regression equations are designed to help determine whether

there is a positive or a negative relationship between the exogenous variable; the iron, copper, lead, and petroleum export sector; and the endogenous variables. The statistical method will also be employed to determine the indirect impact of the specified minerals and petroleum export sector on the selected countries.

The main sources of data for this study are the national income accounts for the selected countries from the United Nations publications, various publications of the Statistical Abstract of Latin America by the Latin American Center, International Financial Statistics published by the International Monetary Fund, and various publications of the Economic Survey of Latin America published by the United Nations Commission for Latin America. The data under investigation is limited to the period 1950-1971.

Organization of the Study

In order to place the study in proper perspective Chapter II presents a brief theoretical foundation concerned with the role of international trade on economic development.

Chapter III provides a general historical review of some of the development problems of Latin America followed by a discussion on the major economic problems of each selected country and on the minerals of special concern to this study.

Chapter IV offers statistical information on the quantitative importance of iron, copper, lead and petroleum exports. Data on growth rates of gross national product and on growth rates of per capita income are also reviewed for each country.

Chapter V presents an analysis of the direct contribution of the export sector for the selected minerals on the domestic economy for each of the selected countries. This includes the contribution of the minerals and petroleum export sector on the various endogenous variables.

Chapter VI introduces the indirect macroeconomic model designed to analyze the impact of the export sector for the selected minerals and petroleum on the primary macroeconomic variables of the selected economies.

Chapter VII presents a summary and the conclusions of this study.

CHAPTER II

THE THEORETICAL CONSIDERATIONS

In order to lay the theoretical foundations of this investigation, a survey of a considerable body of theoretical contribution on the impact of international trade on the economic development of the less developed countries was evaluated. This survey was organized as follows:

First, the literature was researched in order to discover the theoretical basis which upheld the view that international trade contributed to the economic development of the less developed countries.

Second, the literature was investigated for theoretical studies which considered international trade as having a negative effect on the economic development of the less developed countries.

In general, there are two schools of thought regarding the contribution of international trade to the economic development of the less developed countries.

The First School

The Classical Theorists

The historical development of the theory of international trade begins with the great classical economists Adam Smith, David Ricardo, and John Stuart Mill.

Adam Smith

Adam Smith discussed economic development in terms of general economic principles rather than in terms of a theory of economic development.[1] The cornerstone of his economic development principles was the division of labor theory. Division of labor and specialization were reviewed as the basic elements in the growth of productivity. Economic growth was seen as a self-sustaining process based on increasing division of labor, increasing savings, and technological improvements. But, eventually the development process stops, and each country moves toward a stationary state. When that happens investment and capital accumulation decline, wages fall, profits fall to the zero level, and the economy is in a long-run equilibrium stage.

Adam Smith stressed that trade was an agent of growth: "Between whatever places foreign trade is carried on, they

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[1] Adam Smith, An Inquiry into the Nature and Courses of the Wealth of Nations (New York: The Modern Library, 1937), Edwin Cannan edition.

all of them derive two distinct benefits from it."[2] First, trade stimulates productivity and therefore economic growth becomes a factor that widens the market. This "productivity" doctrine considers foreign trade as a dynamic force because widening the market permits the division of labor, raises the skill of laborers, encourages technological improvements, and allows the trading country to increase returns and economic development.[3] A second benefit known as the "vent for surplus" theory assumes that an isolated country entering into international trade possesses a surplus over its domestic requirements. This concept implies an inelastic domestic demand for the exportable commodities and a considerable degree of internal immobility.[4]

Besides these two benefits, there is a third factor considered as a gain from trade known as the "comparative costs" doctrine. The comparative costs doctrine implies that the static gains from trade are an important source of profit which allows capital accumulation and growth. Thus, the doctrines of productivity, vent for surplus, and comparative costs support the theory that trade is an important

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[2]Ibid., p. 415.

[3]H. Myint, "The 'Classical Theory' of International Trade and the Underdeveloped Countries" Economic Journal 68 (June 1958): 318-319.

[4]Ibid., pp. 318, 321-322. Myint borrowed the term "vent for surplus" from J. H. Williams, "The Theory of International Trade Reconsidered," Economic Journal 39 (June 1929): 195-209, quoted from a passage in J. S. Mill's Principles of Political Economy.

element in the economic growth of the less developed countries. The doctrine comparative costs was developed further and became prominent in David Ricardo's writing.

David Ricardo

The Ricardian theory of economic development is a dynamic system which tends toward a stationary state where wages are low, and profits are zero.[5] This gloominess results from diminishing returns in agriculture, constant returns in industry, and an increase in the rate of population. Under this system, the increase in demand for food raises the money wage rate and decreases the profit rate, therefore, capital accumulation and the incentive to invest declines. David Ricardo, unlike Adam Smith, does not stress the increases in productivity and is basically concerned with the distribution of output. He stresses two points of free trade which are the static gains from trade due to the differences in comparative costs, and the advantages for an industrial country of importing food. These two aspects of free trade will keep the level of money wage rate down and maintain profits. Trade, therefore, permits the less developed countries to delay the occurrence of the stationary state.

The Ricardian economic growth theory depends upon

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[5]David Ricardo, Principles of Political Economy and Taxation, London, 1817 (reprinted by Everyman's Library, 1911).

capital formation which is based upon the productive powers of labor. The productive power of labor is generally greater when an abundance of fertile land exists. Since Britain did not possess an abundance of fertile land, rent per unit of labor and capital would increase on comparatively fertile land. Therefore, money wages would increase and profits would decrease. To prevent this occurrence, the law of comparative advantage provided the bases of an efficient allocation of resources among industries.

The Ricardian law of comparative advantage was later restated by John Stuart Mill. Ricardo made no attempt to fix a ratio of exchange, however, he determined the limits within which it would be profitable for both countries to import one commodity and export the other. The advantage of exchange between nations comes from being able to obtain, with a given amount of labor and capital, a greater amount of commodities. In other words, a nation gains when it can purchase more goods, with a given amount of capital and labor, than it could have produced domestically with an equivalent capital and labor.

John Stuart Mill

John S. Mill attempted to determine the international exchange ratios by means of his "Equation of

International Demand."[6] He arrived at the ratio of exchange by a theoretical analysis of the relative demands in two countries for two commodities. Commodities are not exchanged between countries on the ratio of cost of production, but on a reciprocal demand in such a way that the quantity imported is exactly compensated for the quantity exported.[7]

Besides the direct or static gain from trade, Mill believes that there were also indirect or dynamic effects of trade. These indirect effects of trade caused by the availability of foreign markets would be an incentive for improvements in technology, improvements in the production process and the specialization of labor. Another consideration is developing people's ambition to work harder in the less developed countries to catch up with the standards of living of the developed countries.[8] Mill considered trade as a factor of development that goes even beyond economic factors:

> The economic advantages of commerce are surpassed in importance by those of its effects which are intellectual and moral. It is hardly possible to overrate the value, in the present low state of human improvement, of

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[6]John S. Mill expressed his views in 1829 and 1830 in his work Essays on Some Unsettled Questions (London: Reprinted by The London School of Economics and Political Science, 1948), p. 2. The same doctrine was later expanded in 1848 in his work Principles of Political Economy (New York and London: The Co-Operative Publication Society, 1900), Volume II, Revised Edition, pp. 92-124.

[7]Ibid., Principles of Political Economy, p. 110.

[8]Ibid., Principles of Political Economy, p. 99.

> placing human beings in contact with persons dissimilar to themselves, and with modes of thought and action unlike those with which they are familiar. Commerce is now what war once was, the principal source of this contact.[9]

Mill did not share the gloomy attitude of his predecessors. He predicted a stationary state, but it was a reasonably prosperous one.

Economic development lost its central place as a subject of economic theories, after 1870, except among the Marxist writers. Neo-classical economists such as Marshall, Walras, and Pareto were concerned with general and partial equilibrium analysis of prices and incomes domestically and through international trade. Although there were two significant contributions on economic development,[10] the effect of trade on economic development was not discussed. Economists who studied trade either overlooked or neglected its importance for economic development. In the twentieth century, around the 1930's an approach to trade and its growing importance for economic development was enunciated in the Staple Theory of Growth.

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[9] Ibid.

[10] J. A. Schumpeter, The Theory of Economic Development (Cambridge: Harvard University Press, 1934), translated from the German edition of 1907; and Allyn Young, "Increasing Returns and Economic Progress," Economic Journal 38 (December 1928): 527-542.

The Staple Theorists

Harold Innis' historical studies of the Canadian cod and fur industries laid the foundation for the School of the Staple Theory of Economic Growth.[11] His ideas did not originate from the problems faced by the developing countries of today but from the Canadian economy over forty years ago.

A staple is a primary product that faces a large and growing demand in world markets. Richard Caves defines staple "as a product with a large natural resources content."[12] Staple production is basically intensive in natural resources and also in capital. The staple theory considers the staple product line or lines as the main force or leading sector in the process of economic development. Harold Innis used the production function in his theory of Canadian economic development to discuss the export led development concept. Since then other economists such as Robert Baldwin and Douglas North have employed the production function to

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[11]Harold Innis, The Fur Trade in Canada: An Introduction to Canadian Economic History (Toronto: The University of Toronto Press, 1930) and The Cod Fisheries: The History of an International Economy (Toronto: The University of Toronto Press, 1954). W. A. Mackintosh is sometimes given credit as a co-founder of the staple theory; see his "Economic Factors in Canadian History," Canadian Historical Review 4 (March 1923): 12-25, and "Some Aspects of a Pioneer Economy," The Canadian Journal of Economics and Political Science 2 (November 1936): 57-63.

[12]Richard E. Caves and Richard H. Holton, The Canadian Economy: Prospect and Retrospect (Cambridge: Harvard University Press, 1959), p. 31.

analyze the growth process.[13]

The staple theory implies that the primary products characterized as a staple product have diverse effects on the growth of the economy. The different inputs used in the staple production, the technological requirements, and the sociological aspects vary from one product to the other. The impact of the staple line on the economy depends on the effectiveness of the staple line to transmit growth to the other sectors of the economy. The characteristics of the staple line stem from the technological aspects of production, or the production function.

The staple theory differs from the classical theory. While the classical school places stress on the indirect benefits of trade, the staple approach argues that there is a direct contribution of primary production for export to the rest of the economy. This theory implies that if the demand for the export staple increases, the quantity supplied will also increase, which, therefore, would result in an increase in income. Thus, spending this income would generate investment opportunities in other sectors of the economy. The inducement to domestic investment resulting from the increased activity of the export sector is divided

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[13]Robert E. Baldwin, "Patterns of Development in Newly Settled Regions," Manchester School of Economic and Social Studies 24 (May 1956): 161-179; and Douglass C. North, "Agriculture in Regional Economic Growth," Journal of Farm Economics 41 (December 1959): 943-951.

into backward, forward and final linkage effects. The backward linkage effect is a measure of the inducement to invest in the domestic production of inputs for the purpose of expanding the export sector. The forward linkage effect is a measure of the inducement to invest in industries using the output of the export industry as an input. The final linkage effect is a measure of the inducement to invest in industries producing consumer products.[14] Because the staple approach theory concentrates on the contribution of the staple export to the rest of the economy, it may be called a theory of capital formation.[15]

The proponents of the staple theory have faith on the reliability of the primary products as leading sectors in the economic development of the developing countries. Rostow's theory of take-off into sustained economic growth depends on a leading sector. For example, railroad development is a prerequisite to the development of a major export industry and that it led to the establishment of modern coal, iron and engineering industries. However, Rostow implies that a sector producing raw materials can lead only if modern technical processing is used in the production, as in

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[14]Albert O. Hirschman, The Strategy of Economic Development (New Haven: Yale University Press, 1958), pp. 98-116.

[15]Melville H. Watkins, "A Staple Theory of Economic Growth," The Canadian Journal of Economic and Political Science 29 (May 1963): 145.

the case of Danish dairy production.[16] At this point Rostow's theory of take-off bears some resemblance to the staple theory.

Some regional economists have used a concept quite similar to the staple export theory known as the "economic base" of a region which is traced to the international trade multiplier. This concept can be applied to countries that are considered as open economies. Since most of the developing countries have high foreign trade ratios, they can be considered as open economies. The economic base of a region is described as:

> That group of industries primarily engaged in exporting from the region under analysis to other regions. An empirical multiplier is determined by observing the historical relationship between this export activity and total activity in the region.[17]

The staple theory approach concentrates on only one or a few export lines, while the export base approach considers the total sector or all the export producing industries. However, the export base could be considered as a leading sector consisting of a group of export lines. If exports are concentrated in just a few lines, the export base reverts to the case of one or a few leading sectors.

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[16]Walt W. Rostow, The Stages of Economic Growth (Cambridge: Cambridge University Press, 1960), pp. 38, 55-57.

[17]John R. Meyer, "Regional Economics: A Survey," American Economic Review 33 (March 1963): 30-31.

This approach considers the "base" as the autonomous growth promoting factor in the economy. It concentrates on autonomous income effects and multiplier relationships also considering non-primary lines. On the other hand, the staple approach goes deeper than the total income and expenditures originated in the primary export lines. It also concentrates on all other growth promoting factors emanating from the staple industry and examines the characteristics of the productive process in the export lines.

The carry over from the export base activities to the rest of the economy would be successful if the primary export sector is diversified, or if the primary product line or lines have certain growth promoting characteristics.[18] If the export commodity is a plantation type commodity characterized as labor intensive with significant increasing returns to scale, unequal distribution of income will result with the bulk of the laborers. However, it would be a different situation for the plantation owner who will tend to spend the income on luxury goods. In the case where the export commodity is produced on a family size farm with smaller amounts of labor, there will be more equitable distribution of income. There will be a demand for a broad range of goods and services, thus, inducing investment in

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[18]Douglass C. North, "Agriculture in Regional Economic Growth," Journal of Farm Economics 41 (December 1959): 943-951.

other types of economic activities.[19]

Other Theorists

Three models relating economic development and foreign trade were formulated by Charles P. Kindleberger in which foreign trade is treated as a leading, a lagging, and a balancing sector of the economy.[20] The first model in which foreign trade leads is a trade expansion model. The foreign demand of the export product is accompanied by technological change, thus, economic development diversifies around an export base. The staple economy could thus be a special case of this model. The second model in which foreign trade lags is a trade contraction model. Domestic investments leads, therefore, creating pressure on the balance of payments which is met by import substitution. The third model in which foreign trade is a balancing sector is based on the autonomous supply push in the export sector. These classifications apply to those countries which are already in the process of development. The export sector can be an engine of growth for the staple economy but on the other hand the export sector might have limited or adverse affects on the economy of a country.

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[19]Douglas C. North, "Economic Growth of the United States before the Civil War" from James D. Theberge, Economics of Trade and Development (New York: John Wiley and Sons, Inc., 1968), pp. 70, 71. Also R. E. Baldwin, "Patterns of Development in Newly Settled Regions."

[20]C. P. Kindleberger, Economic Development (New York: McGraw-Hill Book Co., 1958), Chapter 14.

The theories which propose to attribute to the export sector the role of a leading sector can be most successfully applied to conditions characteristic of the nineteenth century. The implication that foreign trade could not only make an impressive contribution to a country's development but also a device for achieving productive efficiency and an engine of growth is clearly stated in Dennis Robertson's quotation:

> The specialization of the nineteenth century were not simply a device for using to the greatest effect the labours of a given number of human beings; they were above all an engine of growth.[21]

Other writers such as Gottfried Haberler reinforced the classical theory and endorsed the classical international division of labor. The division of labor enables the country to specialize, which in turn promotes the economic well being of the country, increases its national income and frees the participating countries from the vicious poverty circle. Haberler also made a strong case for trade. His position was that international trade has contributed powerfully to the development of the less developed countries in the nineteenth and twentieth centuries and should be expected to do so in the future. He stresses the traditional static gains from trade resulting from more efficient resource allocation and the indirect or dynamic benefits.

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[21]Dennis H. Robertson, "The Future of International Trade," in Howard S. Ellis and Lloyd Metzler, ed., Readings in the Theory of International Trade (Philadelphia: The Blakiston Company, 1950), p. 501.

Those dynamic benefits noted by the nineteenth century classical writers are best described as an outward shift in the production possibility curve. The dynamic benefits accruing to the less developed countries are the provision of essential commodities such as food, raw and semifinished materials; the transmission of managerial talent, skills and entrepreneurship; the dissemination of technology; and the attraction of capital through international investment.[22]

The Second School

The critics of the international trade approach, the development economists, have had a pessimistic view towards the contribution of trade on the less developed countries. Their view stems from the nature of the exports of the less developed countries, i.e., primary products. Each economist seems to emphasize a different cause. A summary of the main causes includes 1) the lack of spread effects, 2) domestic impediments, and 3) the deterioration of the terms of trade.

Hla Myint and the Lack of Spread Effects

Some of the less developed countries such as Asia and Africa did experience some development during the

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[22]Gottfried Haberler, "International Trade and Economic Development," National Bank of Egypt Fiftieth Anniversary Commemoration Lectures, Cairo, 1959, pp. 5-14, and Gerald Meier, Leading Issues in Economic Development (Oxford: Oxford University Press, 1970), pp. 492-497.

nineteenth and twentieth centuries. The Asian agricultural export sector and the African mining export sector expanded rapidly, yet foreign trade failed to bring about an overall economic growth. Myint believes that even though foreign firms in the export sector borrowed capital, the growth in the value of the exports did not have a multiplier effect on the per capita income of the economy.[23] His main reason that the primary export sector of the less developed countries has no major contribution on the economy is due to the lack of spread effects of the primary commodities. Besides, specialization can have an "educative effect" on the people if a country were to specialize in industry. This educative effect which results from international trade helps to develop new wants and needs but does not help to provide new methods of efficient production.[24]

In the less developed countries international trade can have favorable effects, the "spread effects," or unfavorable effects, "backwash effects." The spread effects are usually weaker than the backwash effects. As long as the mechanism of international trade causation continues to operate in this way, the outcome will be a period of stagnation or impoverishment of the poor nations. The spread

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[23]Hla Myint, "The Gain from International Trade and the Backward Countries," Review of Economic Studies 22 (1954-1955): 129-142.

[24]Ibid., p. 140.

effects consist of an external demand for the traditional products of the developing nations. The backwash effects usually rise from the higher rates of population growth which is a characteristic of the poor developing nations; the inabilities of the developing nations for building an infrastructure to compensate for the lack of investment incentives resulting from the unfavorable economic conditions; and the weakening of the domestic productive structure due to the competitive cheaper imports from the developed nations.[25]

Gerald Meier and Domestic Impediments

Gerald Meier considered the experience of peripheral countries with regard to the effect of an expansion in the export sector on the rest of the economy. Although he failed to mention the type of exports, he seems to imply that he observed primary products. He considered the characteristics of the export commodity as being a significant factor in the promotion of economic development. However, he believed that the transmission mechanism to the rest of the economy has failed for the peripheral countries. The reason for this failure was due to "the differential effects of different exports, and . . . the domestic market

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[25]Gunnar Myrdal, Economic Theory and Underdeveloped Regions (London: Gerald Duckworth, 1957), pp. 27-35.

conditions of the poor country."[26] Meier believes that even though the export product has those characteristics to enable a successful transmission to the rest of the economy, those characteristics will still fail to start the peripheral countries to move. The main obstacles are domestic impediments and weak spillover effects. Market imperfection due to factor immobility, price rigidity, and limited knowledge of market and technological conditions are a few reasons which have limited the gain from exports to the rest of the economy.[27] The factors of production argument and the demonstration effect argument have been formulated as attempts to explain domestic impediments.

According to the "factors of production" argument, the consequence of factor inflows into the peripheral countries and the factor mobility have been unfavorable to these countries. The factor inflows resulted from the needs of primary production export. Importing of labor helped maintain low wages which had an adverse effect on the economy, thus, adopting modern technology and new skills in the export sector were minimized. The production of primary products for export was organized like an enclave. These enclaves, which are mainly foreign owned, enjoyed a

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[26]Gerald H. Meier, International Trade and Development (New York: Harper and Row Publishers, 1963), p. 177.

[27]Ibid., pp. 182-184.

monopsony and a monopoly position.[28] The natives, as laborers, confront the monopsonistic power of the foreign plantation and mining parties. As producers, the natives are faced with the exporting and processing firms which possess monopsonistic powers in buying the native products. As consumers, the natives buy the imported commodities from monopolistic sellers and distributors.

The enclaves were not helpful in financing other sectors of the domestic economy with foreign investment concentrated in the development of the country's natural resources. Foreign investments have also become to a high degree an economic enclave. These enclaves which have been large as in the case of mining and plantations, have not integrated into the domestic economy but remained attached to the interests of the investing nation. Thus, the enclaves created by foreign investment gave rise to dual economies characterized by a lopsided economic structure. These dual economies are characterized by a backward low productivity export sector. There are small spillover effects emerging from the enclaves since the enclaves strive to restrict the interactions with the rest of the economy, and thus the income effects are weak due to leakages of income abroad.

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[28]Hla Myint, "An Interpretation of Economic Backwardness," Oxford Economic Papers 6 (June 1954): 154-155.

The "demonstration effect" argument suggests that the consumption in the rich countries raises the propensity to consume in the poorer countries, and thus limits the capital accumulation. The demonstration effect could place pressure on the balance of payments and impede reaching the adequate savings ratio.[29] This results from the integration of the less developed country in the international economy through the exports of its primary products and the desire to imitate the consumption habits and patterns of the advanced countries.

Raul Prebish and the Deterioration of the Terms of Trade

The third major cause why primary products have adverse effects is Raul Prebisch's argument that there is a secular deterioration in the commodity terms of trade of the developing countries. In the "Prebisch thesis,"[30] the opinion is expressed that Adam Smith's international division of labor view is not correct. Prebisch explains that the disparity between the economic development in the advanced countries, the center, and in the developing countries, the periphery is due to the technological role which

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[29]W. F. Stolger, "A Note on the Multiplier, Flexible Exchanges and the Dollar Shortage," Economia Internazionale 3 (August 1950): 772-773.

[30]The "Prebisch Thesis" are his two articles: "The Economic Development of Latin America and Its Principal Problems," Department of Economic Affairs, Nation Unidas, 1950, and "Commercial Policy in Underdeveloped Countries," American Economic Review 49 (March 1959): 251-273.

the center plays, whereas the periphery plays the role of the supplier of raw materials for the center. Because the periphery did not share in the profits of the technological progress, the increase in productivity of the periphery benefits the industrial center.[31]

The theory of international division of labor by Adam Smith rests on the assumption that the different economies who participate in trade are strictly complementary. However, Prebisch believes that the interchange between peripheral and central nations is based on the exports of primary products to the center and the imports of industrial products to the periphery. This commercial interchange does not facilitate economic development in the periphery. Therefore, Prebisch suggests that the solution is the industrialization of the peripheries.

> Although it is not an end in itself, (industrialization is) the principal means at the disposal of these countries for obtaining a share of the benefits of technical progress and of progressively raising the standard of living of the masses.[32]

Prebisch recommends that industrialization by means of import substitution is essential for the progressive growth of the peripheries. Industrialization would also be a means to increase labor productivity, and the wage level.

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[31]Charles Frankenhoff, "The Prebisch Thesis: A Theory of Industrialism for Latin America," Journal of Inter-American Studies 4 (1962): 185-206.

[32]Raul Prebisch, "Commercial Policy in Underdeveloped Countries," p. 25.

At the beginning of the sixties, Prebisch suggested that the commercial policies of the advanced countries should be changed so that the countries in the process of developing should export nontraditional products. The root of the poverty in the periphery is explained by the vicious circle. According to the theory of the vicious circle productivity in the less developed countries is very low due to the lack of capital. The lack of capital is due to the low savings level resulting from low productivity.[33] Thus, there is a tremendous need to break the vicious "low productivity-low savings" circle by increasing foreign capital.

The "Prebisch Thesis" has been subjected to some searching criticism. First, Prebisch overlooks the possibility that the economic situation of the Latin American nations may not improve because of industrialization, but might decline. Another criticism is that the agricultural laborer might be able to work in areas offering better terms of wages. Prebisch identifies agriculture with poverty, which is not true in the case of such countries as Australia, New Zealand and Denmark. Also industrialization is definitely not synonymous with prosperity as in the case of Spain and Italy. The problem in many poor countries is due to poor agriculture and poor industry and not merely the

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[33]Raul Prebisch, "The Economic Development of Latin America and Its Principal Problems," p. 37.

existence of agriculture or the lack of manufactures.[34] Despite the criticisms of the Prebisch doctrine, some economists consider that his doctrine "subsists as the most practical, cohesive and feasible solution for an immediate and progressive development of Latin America."[35]

The debate on the thesis of secular deterioration of the terms of trade[36] of developing nations began with the report of the First Session of the Subcommission on Economic Development of the United Nations Economic and Employment Commission. This report tentatively showed that the price increases of capital goods made the economic development for a developing nation more difficult. Thus, a study of the relative trends of the prices of capital goods and of prices of primary goods was undertaken.[37] The findings demonstrated that the ratio of prices of primary products to those of manufactured products declined.

There are different causes for the deterioration of terms of trade. These causes are usually associated with the cyclical movements of primary products and

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[34]Jacob Viner, International Trade and Economic Development (Glencoe, Illinois: Free Press, 1966), p. 73.

[35]C. Freyman, Dr. Raul Prebisch, A Most Distinguished Latin American Economist (San Antonio: St. Mary's University Press, 1970), p. 31.

[36]"Terms of Trade" is the ratio of export prices to import prices, in general terms.

[37]This report was prepared by the United Nations, Department of Economic Affairs, Relative Prices of Exports and Imports of Underdeveloped Countries, December 1949.

industrial prices, the rates of increase in demand for imports between the industrial and primary producing countries, and the disparity between the productivity of primary products and the productivity of manufactured goods.[38] The prices of primary products have risen under prosperous periods and decreased substantially in periods of depression, whereas the industrial products have risen less in periods of prosperity and did not fall as much during depression as they have risen in prosperity. Thus, the gap between the prices of the primary products and the industrial products has widened. The second cause for the deterioration of terms of trade is explained by Engel's law and the technical progress in industry which decreases the quantity of raw materials used per unit of output.[39] The third cause of the deterioration of terms of trade is attributed to the fact that the gains from increased productivity of manufactured products was distributed in the form of higher profits and wages, while in the developing countries the gains from productivity although it was small

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[38]Raul Prebisch, The Economic Development of Latin America and Its Principal Problems, pp. 8-14.

[39]Hans Singer, "The Distribution of Gains between Investing and Borrowing Countries," American Economic Review Papers and Proceedings 40 (May 1950): 477-479; and R. Prebisch, "Commercial Policy in Underdeveloped Countries," 261-264. Singer is usually associated with Raul Prebisch with respect to the terms of trade concept.

was distributed in the form of price reductions.[40]

Summary

The classical economists from Adam Smith to John S. Mill were interested in studying long term economic development. They focused their attention primarily on factors which play an important role in determination of development. Such factors were the division of labor and markets, land, and capital accumulation.

Some twentieth century writers argue that external trade has direct and indirect benefits, and can be considered as an engine of growth. However, there is an apparent reluctance among other writers in accepting this idea. These writers attribute a variety of reasons for the failure of the non-export sector to respond to income and profit opportunities created by the export sector. Reasons such as weak spread effects and market imperfections due to the lack of knowledge or occupational and geographical immobility of workers are but a few examples. Another reason for the failure of the export sector to contribute to the rest of the economy is the characteristic of the exported commodity. Since most less developed countries are exporters of primary products, the contention that the terms of trade have a long run tendency to deteriorate for primary exporting countries occupy the central issue in Prebisch's theory of

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[40]Raul Prebisch, The Economic Development of Latin America and Its Principal Problems, pp. 8-14.

trade limited growth. This tendency has adverse effects on the less developed countries since the prices of primary products deteriorate in relative terms over the long run, thus reducing the export earnings.

CHAPTER III

ECONOMIC AND HISTORICAL CONSIDERATIONS

A General Background of Latin America

In spite of the different dynamic impulse of the various economies as well as the differential levels of economic development that can be found among the Latin American countries, some of the basic economic and social characteristics and problems are to a large extent alike. The roots of these common characteristics are to be found mainly in the common Spanish and Portuguese colonial background. The structural characteristics that have been selected for this study are land ownership, foreign trade, inflation and the social conditions in Latin America.

Land Ownership

The original factors explaining the high concentration of land-ownership in a few hands are to be found far back in the history of the Spanish and Portuguese colonial regimes of Latin America and in the systems of land appropriation used by the conquistadores. Some of the large land holdings, especially in Central America and the Caribbean area, and most of the mining activities became

foreign property. These export sectors became high productive, sharing in the advanced technology of the international economy. Besides, the traditional activities of the national economy were hardly affected and only activities related directly or indirectly to foreign trade were reorganized and influenced by it. Thus, as a consequence of these historical factors a high concentration of the ownership of land is still now one of the general characteristics of the Latin American countries; except Mexico, Cuba and Bolivia, which have experienced revolutionary changes in land tenure.[1]

Foreign Trade and Economic Integration

The international trade sector in Latin America is considered important. Exports assume a large role as a source of earnings. Imports are in general crucial to the economy. The Latin American imports are basically inputs for the agrarian and industrial sectors. Thus, failure to obtain these inputs will result in a reduction of the rate of growth or it might even result in a depression.

The problem of vulnerability to foreign trade fluctuations is not the relative size of the foreign sector but

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[1]Richard P. Schoedel, "Land Reform Studies," Latin American Research Review 1 (1965-66): 75-115. See S. L. Barraclough and A. L. Domike, "Agrarian Structure in Seven Latin American Countries" in N. C. Nisbet, ed., Latin America (New York: The Free Press, 1969), p. 91.

the structure of exports and imports.[2] One of the best known characteristics of the Latin American economies is their heavy dependence on only a few exports of primary products. A very large proportion of their foreign exchange is usually derived from the export of only one or two commodities. However, there are countries such as Argentina, Mexico, and Peru, where the range of exports is considerably greater. Generally speaking Latin American countries are exporters of a few primary products and importers of numerous manufactured industrial products. Even today, after a decade or so of deliberate attempts at diversification, a single commodity dominates their exports, and the "all-the-eggs-in-one basket" syndrome still exists in Latin America.

The great dependence on one or two export products is a reflection of their failure to trade among themselves and a reflection of their limited industrialization. The Economic Commission for Latin America made an exhaustive study of the efforts of a common market under the supervision of Dr. Raul Prebisch.[3] The recommendations of the study supervised by Raul Prebisch were not immediately followed in the actual development of extensive common markets.

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[2]Economic Commission for Latin America, "Short-Term Economic Fluctuations in Latin America During 1948 to 1959," Economic Bulletin for Latin America 7 (October 1962): 167.

[3]United Nations, Economic Commission for Latin America, The Latin American Common Market, 1959. Dr. Prebisch is sometimes referred to as the Jean Monnet of Latin America, or the father of the Common Market. The term "common market" usually implies integration on a far wider basis than just the trading of goods.

However, the first successful steps toward economic integration resulted in the formation of the Central American Common Market, CACM, and the Latin American Free Trade Association, LAFTA, in 1960.

The movement has progressed furthest in Central America, where five small nations have removed most of the tariff barriers to trade among themselves. Those five nations of Central America are Costa Rica, El Salvador, Guatemala, Honduras, and Nicaragua. In general, the Treaty of Menagua of 1960 provided for free trade among the five countries of most items with restrictions on certain items to be removed during the first five years. By 1967, the restricted items were the important commodities such as coffee and sugar, which were traded outside the Central American Common Market and for which there were international commodity agreements and national quotas.[4] However, a setback for the Central American Common Market started in July 1969 due to the outbreak of war between El Salvador and Honduras. The fighting was a result of traditional antagonisms caused as a result of the migration of people from the highly populated El Salvador to the less populated Honduras. Honduras withdrew from the Central American Common Market in December 1970, but in July 1971 signed bilateral trade

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[4]Joseph Grunwald, Miguel S. Wionczek, and Martin Carnoy, Latin American Economic Integration and U.S. Policy (Washington, D.C.: Brookings Institution, 1972), pp. 41-50.

treaties with the rest of the members of Central American Common Market except El Salvador. Another problem which the Central American Common Market faced was the question of equitable distribution of gains among the members. The disparity of participation is clear by examining the percentage of total intraregional exports. The share of total intraregional exports in 1971 for Guatemala, El Salvador, Nicaragua, Costa Rica and Honduras were 34.6%, 39.0%, 17.6%, 16.8%, and 2.0% respectively.[5]

The Treaty of Montevideo in 1960 included Argentina, Brazil, Chile, Colombia, Ecuador, Mexico, Paraguay, Peru and Uruguay. The treaty established a trade negotiation system aimed at the elimination of custom duties and any other restrictions by 1973. Special provisions or escape clauses were made applicable to trade in agricultural products. The treaty offered special provisions for the less developed nations within the region; special nondiscriminatory measures aimed at protection of their industries, and collective arrangements for financial and technical assistance. Commitments other than trade liberalization were in extremely vague language. They envisaged the reconciliation of export and import vis-a-vis the rest of the world and coordinating capital coming from outside the area. The Montevideo Treaty

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[5]Inter-American Development Bank, Economic and Social Progress in Latin America, Annual Report, 1972 (Washington, D.C., 1973), p. 79.

had recommended the completion of a free trade zone in 1973. However, at a conference in 1969, the date for achievement of the free trade area was extended from 1973 to 1980.[6]

The Andean Group, Bolivia, Chile, Colombia, Ecuador, and Peru, with Venezuela sometimes included and sometimes not, was formed by the Cartagena Agreement of 1969 but did not start operating until January 1, 1971. The Andean Group is a subregional group with LAFTA. Its main objective was to hasten development of these small countries by means of the benefits derived from integration and to consolidate the group's bargaining power within LAFTA. The Andean Group has a chance of success especially if Venezuela decides to join in the agreement. If that happens, then the group would account for approximately one fourth of Latin America's gross national product, population and area[7] (Table 3-1).

The Caribbean Free Trade Area, CARIFTA, started in 1965 between British Guyana, Antigua, and Barbados. Two years later, a wider free trade area was proposed. The CARIFTA members are now Jamaica, Trinidad and Tobago, Guyana, Barbados, Antigua, Montserrat, Saint-Kitts-Nevis-Anguilla, Dominica, Saint Vincent, Saint Lucia, and Granada.

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[6]Inter-American Development Bank, Socio-Economic Progress in Latin America, Annual Report, 1971 (Washington, D.C., 1972), pp. 49-50.

[7]Joseph Grunwald, et al., Latin American Economic Integration and U.S. Policy, p. 59.

TABLE 3-1

AREA, POPULATION, AND GNP OF LATIN AMERICAN REGIONAL GROUPS, 1968

Group	Area in Millions of sq. km.	Population in Millions	GNP in Billions	Per Capita GNP
LAFTA	19.3	226.7	$ 95.3	$421
ANDEAN GROUP including Venezuela	5.4	62.2	26.7	429
CACM	0.4	14.0	4.5	322
CARIFTA[a]	0.2	4.4	2.2	510
LATIN AMERICA	19.9	250.8	102.2	407

Source: J. Grunwald, M. S. Wionczek, and M. Carnoy, Latin American Economic Integration and U.S. Policy (Washington, D.C.: The Brookings Institution, 1972), p. 59, Table 4.

[a]Includes Jamaica and Trinidad and Tobago. CARIFTA is not included in the computations for Latin America as a whole.

The member nations have agreed on liberalizing a large part of intra-regional trade by the end of 1980 by gradually eliminating tariffs on different groups of products. The problems which face CARIFTA are very similar to those faced by CACM, LAFTA and the Andean Group. These problems are basically due to the small size of the member nations, the distance involved between the member nations and the economic differences among the members.

Inflation

Many Latin American countries have tried during the past years a number of stabilization programs as a means of

preventing an increase in the rate of inflation. A controversy between the "monetarists" and "structuralists" has occupied the attention of Latin American economists. In broad terms the monetarists regard inflation as basically a monetary phenomenon amenable to correction by monetary and fiscal means. The structuralists, on the other hand, see both the fundamental causes and the socially acceptable remedies of inflation in the economic and social structure. The structural factors for the existence of inflation include an agricultural system which fails to expand output in response to a rise in demands; a fiscal system which does not produce adequate revenues; is characterized by imperfect markets for goods, labor, and capital; and an unstable or stagnating foreign market for exports. Both sides have strong arguments to defend their positions. It would be worthwhile to present an analysis of the causes of inflation in Latin America viewed from both positions.[8]

The monetarists reflect the orthodox explanation of inflation in terms of the expansion of the volume of money in relation to the growth of real output. The monetarists would not deny the desirability of flexible monetary and fiscal policies for offsetting sudden decreases in foreign exchange income or the need for other types of

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[8]See G. Meier, W. Baer and I. Kerstenetzky, ed., Inflation and Growth in Latin America (Homewood, Ill.: Richard D. Irwin, 1964); also A. Hirshman, ed., Latin American Issues (New York: The Twentieth Century Fund, 1961).

compensatory financing. However, they would insist that substantial and continuous price increases are a direct consequence of monetary expansion, and that a monetary policy that permits such a state of affairs to continue will create other forces that will accelerate the inflationary movement. They believe that inflation cannot be contained, or its consequences avoided by government interference.

Monetarists attach considerable significance to the relationship between inflation and the balance of payments. Excess inflationary demand increases imports and discourages exports. Unless the resulting balance of payments deficit generated by inflation can be covered by reserves or capital imports, the country must impose import controls or undergo devaluation, or both. Imports controls shift purchasing power to domestic goods with a consequent increase in inflationary pressures and the further discouragement of exports.

The monetarists position which is associated with the International Monetary Fund may be summarized as follows:

1. Inflation is the result of excess aggregate demand caused by excessive monetary and fiscal policy.
2. Supply inelasticities contribute to inflation since they are the result of economic policies adopted as a result of inflation or in order to combat inflation (for example price controls). Thus, returning to the free market system will reduce inelasticities.
3. Price stability is a necessary condition for growth, therefore price stability should get top priority.

The structuralist approach is associated with the United Nations Economic Commission on Latin America. They

view inflation as being the result of structural and institutional rigidities. Thus, they attempt to solve economic and social problems through changes in structure such as exchange controls, multiple exchange rates and monetary expansion to finance the deficit of the National Treasury. Monetary policy and the determination of the money supply, according to the structuralists, does not play an independent role. A prominent structuralist says: "Changes in the supply of money are, generally speaking, the expression of real forces acting in the economy."[9]

Structuralists strongly believe that price stability is not a proper objective of economic policy in itself in the sense that stability should be given equal status with economic growth and that price stability is significant only as a means of growth. Prices are stable as required by increased employment and a redirection of productive factors. If something happens to disturb this equilibrium, it is usually attributed to be due to a fall in export earnings. Government policies to encourage export diversification and the export products will result in increased earnings. Government controls such as multiple exchange rates should be used to encourage importing capital goods and to discourage importing consumer goods. The supply inelasticities could be corrected by long term

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[9]Dudley Seers, "Inflation and Growth, A Summary of Experience in Latin America," Economic Bulletin for Latin America 7 (February 1962): 25.

government programs. Thus, generally speaking, in order to combat inflation monetary and fiscal policies are opposed by the structuralists.

Raymond Mikesell defines inflation in Latin America by saying:

> An annual rate of increase of less than 5 percent in the cost of living index as constituting relative stability for Latin American countries: a rate of increase of 5 to 10 percent as constituting moderate inflation: and any rate above 10 percent per annum over a period of several years as indicating substantial inflation.[10]

The relationship between growth and inflation in the Latin American countries is shown in Table 3-2. From Table 3-2, Venezuela had a very low rate of inflation and a high GNP growth rate in the first period and only 1.3 annual increase in real GNP for the second period. However, Argentina, Brazil, and Chile had a substantially high rate of inflation and some growth in their GNP for both periods. To conclude, the countries in this study experienced a decrease in the rate of inflation for the 1960-1970 period except for Brazil. Brazil experienced an increase in the real GNP for the 1960-1970 period, while Venezuela's real GNP declined for that period.

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[10]Raymond F. Mikesell, "Inflation in Latin America," in Latin America: Problems in Economic Development, ed. Charles T. Nisbet (New York: The Free Press, 1969), p. 145.

TABLE 3-2

ANNUAL INCREASE IN THE COST OF LIVING AND THE ANNUAL GROWTH OF REAL GNP

Country	Annual Increase in Cost of Living 1950-1960 %	Annual Growth in Real GNP 1967 Prices %	Annual Increase in Cost of Living 1960-1970 %	Annual Growth in Real GNP 1970 Prices %
Argentina	28	3.0	21	4.2
Bolivia	--	--	6	5.1
Brazil	21	5.8	43	6.0
Chile	28	3.6	26	4.3
Colombia	7	4.7	11	5.1
Costa Rica	2	6.2	2	6.4
Dominican Republic	1	6.1	2	3.5
Ecuador	3	4.9	4	5.2
El Salvador	3	4.2	1	5.7
Guatemala	1	3.8	1	5.3
Honduras	2	5.0	2	4.2
Mexico	8	6.1	3	7.0
Nicaragua	5	5.2	2	6.6
Panama	0	5.1	1	8.0
Paraguay	29	2.7	3	4.6
Peru	8	5.1	10	4.9
Uruguay	17	0.0	44	1.3
Venezuela	2	8.2	1	6.1

Source: J. Hunter and J. Foley, Economic Problems of Latin America (Boston, Mass.: Houghton-Mifflin Co., 1975), Table 9-2 and Table 9-3, pp. 269-270.

The Distribution of Income and General Social Conditions

The distribution of income in Latin America, be it by factor shares, by income ranges or even by areas within each country, is extremely unequal. According to a study by the Economic Commission of Latin America, it was found that there is a greater concentration of income in a small

percentage of the population. A third of all income is concentrated in the hands of 5% of the population, whereas 16% of all income was in the hands of half the population.[11]

The levels of nutrition, health, housing, and other social conditions vary enormously from one country to another. Noneconomic factors such as climate and main crops are very important. Conditions are in many aspects also dependent on the level of economic development of each country. The more significant phenomenon, however, is that even in countries that have made significant progress in their economies over the last few decades, and that have developed welfare policies, social conditions do not seem to have improved correspondingly for the lower income groups.

An Economic Background of Brazil, Chile, Mexico, and Venezuela

Brazil

Brazil is the largest of the Latin American nations, with a land area greater than that of the United States.[12]

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[11]United Nations, Economic Commission for Latin America, The Economic Development of Latin America in the Postwar Period (64 II G6), 1964, pp. 54, 65.

[12]Brazil is divided into five natural regions. The five regions are the Northern region (states of Amazonas, Pará, Acre, and Territories of Amapá, Roraima, and Rondonia); the Northeastern region (states of Maranhão, Piaúi, Ceará, Rio Grande do Norte, Paraíba, Pernambuco, Alagos, and the territory of Fernando Noronha); the Eastern region (states of Sergipe, Bahia, Espírito Santo, Minas Gerais, Rio de Janeiro, and Guanabara); the Southern region (states of Sao Paulo, Parana, Santa Catarina, Rio Grande do Sul); and the Central Western region (states of Goiaś and Mato Grosso).

The Brazilian republic was awakened to its industrial potential by President Getulio Vargas after 1930.[13] In 1938, Vargas announced a new constitution, the "Novo Estado." The new constitution established a fascist corporate state in which both labor and business were to be organized in association and made subservient to the state. By the time Vargas was forced out in 1945, inflation had already begun and the World War II was the major reason for intensifying the inflationary trend. In 1950, Vargas came back and the situation worsened. Vargas tried to cure the symptoms of inflation by setting price controls, and regulating trade and investment. However, the remedies proved worse than the disease and the economic conditions worsened. Ever since then the Brazilian economy was faced with an increasing rate of inflation. The major economic problems still facing Brazil are inflation, low income, and inadequacy of foreign capital.

Major Economic Problems of Brazil

Three basic economic problems characterize the Brazilian economy, inflation, low income and inadequacy of foreign capital. The last two problems are usually blamed on the violent inflation rate in Brazil. Although, inflation in Brazil has been terrifying, it has not been as

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[13]Robert Alexander, Labor Relations in Argentina, Brazil, and Chile (New York: McGraw Hill, 1962), p. 25, and Brazil Embassada U.S., Survey of the Brazilian Economy (Washington, D.C.: Brazil Embassy, 1966), p. 19.

severe as the Bolivian or Chilean inflation for the 1950-1960 period. The Brazilian inflation is caused by excess demand and by the pressure of costs. On the demand side, the continual increase in prices has been mainly attributed to two basic factors. The first factor is due to the federal deficits which are financed through loans from the monetary authorities. The second factor is due to the expansion of bank credit to companies. While on the cost side, prices have been pushed upwards by the frequent wage adjustments granted by the governments.

Two serious economic problems which are usually blamed on inflation for their occurrence are the low income level of the society and the discouragement of inflow of foreign capital. Income is unequally distributed in Brazil and there is a need for the progressive tax rate system. Inflation could also be blamed for the deterence of the inflow of foreign capital. John Johnson states:

> Foreign private capital showed great reluctance to enter the field in the face of economic uncertainties and slogans that were rich in nationalist overtones. New United States private investments in Brazil in 1959 amounted to $218 million and to $95 million in 1969.[14]

Iron Ore in Brazil

Iron is an abundant mineral, forming five percent of the earth's crust. The production of iron comes from

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[14]John J. Johnson, "Politics and Economics in Brazil," Current History 42 (February 1962): 93.

ore which is then shipped to the smelting factories. Iron ore is a commodity which is used directly or in the form of steel. The Brazilian iron ore resources were known in the years prior to World War I. With the outbreak of World War I, it was impossible for the interested European financial group to develop this resource. Negotiations were further delayed until 1928. With the break of the world economic crisis and the Brazilian nationalistic tendency, the granting of mining concessions to foreign companies was opposed. The 1937 constitution actually excluded any foreign participation in the exploration of iron until a more liberal constitution was issued in 1945. Recently foreign investors are playing a significant role in the development of iron ore in Brazil.[15]

Almost all the iron ore in Brazil is produced from Minas Gerais. The main producing mines are located in Itabia, the Vale do Rio Doce and the Acesita companies; in Morro Agudo, the Samitri Company; in Belo Horizonte, the Mineracão Novalimense and Mouesmann companies; in Itabirito, the Antines group; and in Congonhas, the Siderurgica Nacional, the Mineracão de Ferro e Carvão and the Muller group. The government controlled companies, Ciá Vale do Rio Doce, S.A., CVRD, and Cia Siderurgica Nacional, CSN,

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[15]Raymond F. Mikesell, "Iron Ore in Brazil: The Experience of the Hanna Mining Company," in Foreign Investment in the Petroleum and Mineral Industries, Raymond Mikesell, et al. (Baltimore: The John Hopkins Press, 1971).

the latter being a government owned steel company which produces iron ore for its consumption, accounted for two thirds of the iron output and eighty percent of iron ore exports in 1962.[16] Although the iron ore reserves of private companies are larger than those of the government controlled companies, the government controlled company CVRD will continue to account for most of Brazil's exports of iron ore.

Chile

The most advanced nation of the Andean group is Chile. The Andean nations Bolivia, Chile, Colombia, Ecuador, and Peru, extend from the Isthmus of Panama southward along the west coast of South America to the Straits of Magellan and Tierra del Fuego. Chile extends southward 2,700 miles, but at no point is it wider than 100 miles.[17] Northern Chile is an arid region which contains most of the minerals. Central Chile contains most of the arable land, population, capital, industry, and the large farms mostly owned by descendents of the Basques. The southern region of Chile contains the small farms which are owned by descendants of German and Italian immigrants. Chile is racially homogeneous with virtually no Negroes and few Indians. Chile has been characterized by maintenance of a system of

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[16]Ibid.

[17]Galo Playa, Latin America--Today & Tomorrow (Washington, D.C.: Acropolis Books Ltd., 1971), p. 183.

democratic order and traditional respect for constitutional standards.

Major Economic Problems of Chile

Despite Chile's natural advantages due to its mineral resources, it has many serious economic problems. There are three basic problems, over dependence on copper export, inflation, and the need for further industrialization.

Chile is not unusual in its excessive dependence on one export only. During the depression of 1929, the Corporacio de Fomento de la Produccion, CORFO, was formed.[18] This corporation is a development corporation aimed at lending large sums to private and public enterprises for development and industrialization purposes.[19] However, the internal promotion of industry through the extension of

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[18]Act No. 6334, of April 29, 1939, established two corporations: one for reconstruction, and the other for development. In the discussion of the Bill in the Legislative Assembly, "The government argued that most of the money voted would go to reconstruction and would be only indirectly productive. Therefore, to avert inflation, production must be stimulated." Herman Finer, The Chilean Development Corporation (Montreal: International Labour Office, 1947), p. 11. However, as Professor Haberler puts it, "That inflation can be cured or relieved by more spending, even if it were for productive projects, is about as sensible as to suggest that the best method to make a drunk sober is to force whiskey down his throat." Inflation Causes and Cures, revised and enlarged edition (Washington, D.C.: American Enterprise Association, 1961), p. 81.

[19]Robert J. Alexander, Labor Relations in Argentina, Brazil, and Chile (New York: McGraw-Hill Book Co., 1962), pp. 237-238.

credit to business led to serious inflation.

The "structuralist" school which looks upon inflation as a necessary evil in the structurally defective countries of the hemisphere has been largely the offspring of the Chilean inflation. Inflation came about in Chile as early as 1930 due to the great volume of loans made to business and government enterprises. In September 1955, the Washington consulting firm of Klein & Saks arrived in Santiago and like the United Nations and International Monetary Fund missions of 1950, had been expected to survey the scene and write a comprehensive report with their recommendations. The Klein-Saks model in 1956 was designed to combat inflation by making growth compatible with a slow down in inflation. This method aimed at reactivating the Chilean economy as well as keeping inflation in check by increasing demand was successful until 1967.[20]

The third economic problem of Chile is the need to industrialize. An important step in the promotion of industry was the formation of the government planning and industrial development corporation, the Corporacion de Fomento de la Produccion. This corporation not only lends large sums of funds to business enterprises through the Central Bank, but it can also engage in enterprises on its own.

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[20]Albert O. Hirschman, Journeys Towards Progress, Studies of Economic Policy Making in Latin America (New York: The Twentieth Century Fund, 1963), pp. 159-223.

Copper in Chile

The Chilean economy has depended for several centuries on the export of minerals. Copper has been the country's major export during two periods. The first period extended from some time in the eighteenth century, or about a hundred years after copper mining began in Chile, into the 1890's. For a few decades after the first copper boom, natural nitrates were Chile's principal exports. The country controlled most of the world's supply of these salts and thus, enjoyed high prices and revenues from them. However, this monopoly was broken at the time of World War I by the development of synthetic nitrates, and the Chilean industry contracted to a low level of output. At the same time, methods of mining large, low grade copper deposits were developed. These methods required larger investments than those that had previously attracted local capital. Chilean investors were unwilling to finance these projects, thus, foreign enterprises came to dominate the industry. This is perhaps the chief feature distinguishing the present period of copper mining from that of the nineteenth century. By the 1920's U.S. enterprises dominated the Chilean copper industry. This dominance continued to increase until the late 1940's.

The structure of the Chilean copper industry is based on three main categories of copper mining; the large scale mining, the small scale mining and the medium scale

mining. The large scale mining includes those companies producing over 75,000 metric tons per year. Those companies are usually foreign owned companies. The small scale mining companies are those with a capital of less than 20,000 Chilean escudos. They represent investors with small capital and primitive means of production. The medium scale mining companies compromise all other companies.[21]

The three large mines which constitute the "Gran Mineria" are El Teniente, Chuguicamata, and the Andes Copper Mining Company. El Teniente and Chuguicamata are the largest underground mine and the largest open pit copper mine in the world, respectively.[22] The Andes Copper Mining Company came into production in 1959, after exhaustion of the nearby Potrerillos deposit.

The medium scale copper mining or the "Medina Mineria" and the small scale copper mining or the "Pequena Mineria" usually depend on the value of gold or silver in the ore and cannot profitably mine copper lacking in precious metals. It was estimated that in the early 1960's, the Pequena Mineria could work ore below 3 percent in grade. The limits for the Medina Mineria are about 1.8 percent and 1.5 percent was estimated for the Gran Mineria.[23]

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[21]Ibid., p. 94.

[22]Joseph Grumwald and Philip Musgrove, Natural Resources in Latin American Development (Baltimore and London: The John Hopkins Press, 1970), p. 167.

[23]Estimates are from CORFO, Geografia Economica de Chile (Santiago de Chile, 1965), pp. 585-589.

After the depression of the 1930's and World War II, the Korean War was the third shock for Chile. Chile's gradually falling market shares produced an increasing awareness on the part of the government. After considerable debate in 1952, Law 10,255 was passed. The government was given a monopoly on the export of copper. Profits from these sales were to go to the Treasury. A windfall source of fiscal income from the Gran Mineria was over $190 million between 1952 and 1955. This income was due to the authorization of the Central Bank of Chile to buy copper at 24.5 cents per pound and sell it for 35.5 cents per pound.[24] When the Korean War ended, copper prices fell sharply and the Chilean government was left with huge stocks of unsold copper which was later sold to the United States government for its military stockpile. By 1955 the Law 11,828, the Nuevo Trato al Cobre, or "New Deal," abolished the discriminatory exchange controls and a single direct tax on profits was executed instead of the variety of taxes. Under this law, a flat fixed tax rate of 50 percent on profits for the new companies forming under the new law. For the existing companies, a rate of 75% was established at a base level of production declining to 50 percent at twice that level and rising 80 percent if the output fell below 80 percent of

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[24]Grumwald, J. and Philip Musgrove, Natural Resources in Latin American Development, p. 169.

the base volume.[25]

The country recovered its position as the world's second largest producer between 1955 to 1960. By 1960, the impact of the tax reduction on the Chilean economy was spent. The copper companies had plans for expansion of production and new mines. Several issues were involved in the negotiations of 1960-1961, and efforts to pass a new law in 1963 was unsuccessful by the administration. The Christian Democratic Administration which took power in the election of 1964 was also opposing the companies' plans and demands of 1960-1961. However, an agreement was reached in which the companies would operate according to the law of 1955 while the government guaranteed loans for the companies, appropriated the necessary funds, and authorized state participation in joint enterprises.

The law 16,425 was finalized in January 1966. It authorized investment within the new joint Compania Minera Audina at Rio Blanco and by Anaconda at Chuquicamata and El Salvador in December 1966. The law 16,425 created the joint Sociedad Minera El Teniente in 1967, whereas the Compania Minera Exotica was created later in 1967. The law of 1966 followed the Nuevo Trato except that the minimum tax rate was 52.5 percent and the penalty for cutting output below the base level is 85 percent. For nearly four years after

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[25]Ibid., p. 170.

the passage of the law, the companies, specially Anaconda was able to make and retain large profits from the high price of copper. The objective of the Chilean government was not to gain majority control but also to benefit from the continued high copper price.[26]

On December 22, 1970, a Constitutional Reform Bill was submitted to the Chilean Congress to permit the expropriation of the mineral resources of the large copper mining companies. The Reform which became a law on July 19, 1971 provided that the large copper companies; joint ventures formed by the Chilean government and the United States mining companies in Chile--Kennecott, Anaconda, and Cerro; be nationalized. The mineral resources of the joint ventures become the property of Chile without compensation and payment for the related physical facilities is determined by the government. El Teniente Mining Company owned by the Braden Copper Company, a subsidiary of Kennecott was included in the reform bill. Under terms of expropriation, the compensation for Braden's interest in the related facilities of El Teniente will be only as much as the Chilean government decides it wants to pay. Of the $92.7 million in notes owned to Braden by El Teniente, $80 million is subject to a contract of guaranty against expropriation by the Overseas Private Investment Corporation, an agency of

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[26]United States, Department of Interior, Bureau of Mines, Mineral Trade Notes (Washington, D.C.: Government Printing Office, May 1967), p. 8.

the United States government. Kennecott notified OPIC that it will require full compensation from OPIC for any expropriation loss sustained in respect of this guaranteed debt. However, the Chilean Constitution authorized compensation for the related facilities of El Teniente.[27]

Mexico

Mexico stands out as the natural leader of Hispanic America. It has the largest Spanish speaking population. Mexico is also the nation with the most homogeneous indigeneous population in Latin America. It has discouraged immigration and has been most unwilling to grant citizenship to foreigners. Thus, its population is largely native and are not composed of second or third generations of European immigrants. Current calculations project a demographic growth rate of 3.5% for the next ten years so that by 1980, the Mexican population is expected to reach 72 million.[28]

The Mexican economy since the mid 1930's has grown at an annual rate in excess of 6% in real terms.[29] The economic performance of Mexico has greatly surpassed its

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[27]Editor of Inter American Economic Affairs, "The Kennecott White Paper on Chile's Expropriation of the El Teniente Copper Mine," Inter-American Economic Affairs 15 (Spring 1972): 25-37.

[28]See Urguide, "An Overview of Mexican Economic Development," Weltwirtachaftliches Archin, Band 101, Heft 1, (1968): 13-14. The projections assume a 10% decline in fertility over the decade.

[29]Roger Hansen, "Mexican Economic Development" (Ph.D. Dissertation, John Hopkins University, 1970), p. 98.

Latin American neighbors, and compares favorably with the growth rates of the world's developed economies even though the growth rates of the latter countries during the decades of their rapid industrialization is used for comparison.[30] During the 1960's, Mexico's economic performance was also quite impressive. However, in the early 1960's, some economists were quite pessimistic with respect to the Mexican economic growth. A notable Harvard economist, Raymond Vernon, considered that there existed a dilemma in the Mexican economy.

In his Dilemma of Mexico's Development Raymond Vernon[31] made a prediction of Mexico's future growth which was "very pessimistic."[32] He suspected that Mexico will be faced with economic difficulties for its continuing development and that the political system will not be able to

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[30]Simon Kuznets, Postwar Economic Growth: Four Lectures (Cambridge: The Belknaps Press of Harvard University Press, 1964), pp. 129-138.

[31]Raymond Vernon, The Dilemma of Mexico's Development: The Roles of the Private and Public Sectors (Cambridge: Harvard University Press, 1963); William Glade, Jr., "Revolution and Economic Development," in William P. Glade, Jr. and Charles W. Anderson, The Political Economy of Mexico (Madison: The University of Wisconsin Press, 1963), pp. 3-101; Dwight S. Brothers and Leopoldo Solis, Jr., Mexican Financial Development (Austin: University of Texas Press, 1966); Robert E. Scott, Mexican Government in Transition (Urbana: University of Illinois Press, 1964); and Tom Davis (ed.), Mexico's Recent Economic Growth (Austin: University of Texas Press, 1967), pp. 3-20.

[32]Dwight S. Brothers, review of The Dilemma of Mexico's Development: The Roles of the Private and Public Sectors, by Raymond Vernon, in American Economic Review 54 (March 1964): 155.

formulate the appropriate policies for Mexico's further growth. In his final chapter of his book, Vernon said:

> In the early 1960's . . . Mexico's economy seemed to be approaching a new series of roadblocks. The country's growth appeared to be slowing a little and the prospects for some new impetus to growth seemed uncertain. If the economy were allowed to drift for very long the loss of momentum might expose the country to serious political risks and economic losses. On the other hand, practically every major change in policy offered some promise of stimulating the country's development also seemed to involve a considerable measure of political risk. The problem for Mexico's leaders was to find a way out of the dilemma . . . to seize the horn on which the country was least likely to be impaled.[33]

The economic difficulties, according to Vernon, were basically four. First, the rapid growth from Mexico's traditional exports and the process of import substitution for consumer goods was slackening off. Second, the businessmen were worried about the size of the Mexican domestic market with respect to the expansion of the production of the existing industries and the introduction of new product lines in the intermediate and producers commodities. The third problem was that the investment in the public sector was circumscribed by the inability to increase taxes and to run government enterprises profitably. Finally, the fourth problem was with respect to foreign resources which offered Mexico little flexibility to fight the declining growth rates which was a characteristic of the 1950's.

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[33]Raymond Vernon, The Dilemma of Mexico's Development: The Roles of the Private and Public Sectors, p. 176.

For each of these economic difficulties Vernon offered a solution. For example, the size of the Mexican market could increase by changing the income distribution in Mexico. Thus, the tax system could take away from the rich and give to the poor. The private investment could be encouraged by reducing the role of the public sector in the industry by using the controls on domestic credit. However, Vernon indicated that such solutions would be too risky for the government to execute. Thus, the dilemma of the economic development lay on the political system for its inability to adopt the necessary changes. The leftist encouraged the expansion of the private sectors, thus reducing the role of the public sector; while the rightist prevented the redistribution of income through higher taxes. In addition, both groups limited the role of foreign investment in Mexico.

By the time the downtrend of Mexico's growth rate ended, two commentators, D. Brothers and W. Glade, wrote their response two years after Vernon completed his analysis. At the time of Vernon's analysis of the Mexican Economic indicators, the average growth rate was 4% per year but by 1960 it was 6.4% in real terms. Thus, the commentators were led to suspect that Vernon had confused cyclical and secular growth trends.[34] Brothers noted that Vernon's

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[34]Dwight S. Brothers, review of The Dilemma of Mexico's Development: The Roles of the Private and Public Sectors, p. 156.

dilemma was "essentially of a political nature."[35] Glade took issue with Vernon's analysis of the Mexican parties, he said:

> There is evidence that the hedgemony exercised by the PRI over the reins of government is so secure for the forseeable future that the administration has even gone out of its way to recognize the minority parties and accord them at least a voice in the legislature.[36]

Despite Mexico's economic growth, Mexico faces a number of economic problems. Two of the major problems will be discussed briefly.

Major Economic Problems of Mexico

Inflation in Mexico is not due to a lack of effective demand, but the insufficient volume of production. This productive capacity could be increased by means of real savings, and improving productivity. In the 1950's, inflation threatened to get out of hand, however, in the period 1960-1970 the annual increase in the cost of living was only 3 percent compared to 8 percent for the period 1950-1960. See Table 3-2. The central bank has maintained a tight money policy. New taxes were imposed towards the end

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[35]Ibid., p. 155. According to Webster's Seventh New Collegiate Dictionary, p. 223, a dilemma is "a choice or a situation involving choice between equally unsatisfactory alternatives." So, has there been a dilemma in the Mexican case?

[36]William P. Glade, Jr., "The Enigma of Mexico's Supremacy Dilemma," Economic Development and Cultural Change 13 (April 1965): 372. The "Revolutionary Coalition," are a group whose origins are traceable to the 1910-1920 struggle and whose political supremacy was institutionalized in the "official" party, the Partido Revolucionario Institutional, in 1928.

of 1974 aimed at the middle and higher income groups. These new taxes include a 50% tax on gasoline sales, higher taxes on new car purchases and higher tax rates on incomes in excess of $1,000 per month.[37]

A second problem is raising the rate of capital formation. Since capital goods are mostly imported, the resources should be allocated to those exports which will finance imports. This means that the increase in exports will not only depend on the output of exportable commodities but also on the size of foreign demand. Any change in foreign markets might mean the difference between prosperity and depression, and between inflation and deflation. Also, price fluctuation might mean the difference between a government deficit and a balanced budget. Developing nations, by themselves are unable to stabilize prices for their primary products or world demand. Solving the problem of price fluctuation could be maintained through international cooperation.

Lead in Mexico

Latin America provides about one-sixth of the world's lead and a slightly smaller share of zinc. It also has about one-third of world reserves of each metal with Mexico

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[37]U.S. Foreign Service, U.S. Department of State, Foreign Economic Trends and Their Implications for the United States, Mexico, FET 75-052, June 1975, p. 4,5.

accounting for approximately half of each metal.[38] Mexico has been traditionally known for the abundance and variety of minerals it produces. The evolution of Mexican mining production occurred in three stages. The first stage, before the arrival of the Spaniards to the end of the Nineteenth century, comprised primarily the mining of precious metals. The second stage lasted from the end of the nineteenth century to the 1940's. Lead, and to a lesser degree zinc, are often found with silver, thus while continuing to produce gold and silver, special attention was paid to the deposits of base metals, such as lead, zinc, iron, copper, tin, manganese, cadmium, and bismuth. During the third stage, from 1940 onwards, mining production has been diversified and enriched by the addition of a wide variety of non-metallic minerals. Among these non-metallic minerals, sulphur, fluorite, and barite have been of outstanding importance. In 1971, Mexico ranked among the six highest producers in world output of twelve minerals and metals. It ranked first place for fluorite and celestite, second in sulphur and graphite, third in silver, antimony, arsenic, barite, bismuth and mercury, fourth in lead, and sixth in zinc.[39]

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[38] J. Grumwald and Philip Musgrove, Natural Resources in Latin American Development, p. 213.

[39] Opeis, Redvers, ed., Business/Mexico 1973 (Mexico: American Chambers of Commerce in Mexico, A.C., 1973), p. 155.

Mining of lead started during the 1940's and the major problems facing this activity was the deficient rail services and labor disputes. During the second half of 1950 there was an increase in the mining of lead due to the impact of the Korean War upon the demand for such metals. However, in 1951 the mine production of lead declined as higher prices permitted lower grade ores to be profitably treated and the shortage of electric power forced some curtailment of production. Mine and smelter production of lead further declined in 1953 by approximately 10%.[40] This decrease was due to the decline in the average price during that year. Economic conditions for lead mining and smelting in Mexico improved during 1954 and prices of lead increased. In addition, the government issued a decree to provide for export tax exemptions of certain alloys of lead and fabricated lead products. This action was equivalent to a government subsidy to the Mexican lead mining industry.

A law of Taxes and Promotion of Mining was published in December, 1955. According to the new law, annual production taxes of the first 5 years output from new mines and those that have not worked for ten years or more were reduced. Production taxes varied according to the form of

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[40]U.S. Department of Interior, Bureau of Mines, Minerals Yearbook 1953 (Washington, D.C.: Government Printing Office, 1954), Volume 1, p. 667.

production and ranked as high as 12.6 percent ad valorem.[41] Although some new activity in development and mining was stimulated by the new law, the mining output of lead in Mexico declined during 1956 through the middle of the 1960's.

The basic principle of the mining system in Mexico is based on the distinction between ownership of the surface area and of the subsurface minerals. This distinction is a heritage from Spanish law included in Article 27 of the Mexican Constitution of 1917. The owner of the surface does not have any right over the mineral deposits. These deposits are considered as part of the domain of the nation which grants the right to exploit them through concessions.[42] In February, 1961, a mining law was passed containing the legal basis for the "Mexicanization" of the industry. Industries should be owned by not less than 51 percent by Mexican naturals or legal persons. However, ownership rises to 66 percent when the concessions are for the exploitation of minerals.[43] Mexicanization proceeded slowly at first since

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[41] Ibid., 1955 edition, p. 671.

[42] Opeis, Redvers, ed., Business/Mexico 1973, p. 159.

[43] J. Grumwald and P. Musgrove, Natural Resources in Latin American Development, p. 158. Due to price fluctuations, the International Lead and Zinc group was formed in 1959 after a United Nations Commodity Conference. The twenty-five member countries including producers and consumers, agreed to gather and publish information. They also support research to develop new uses for the metals. See p. 216.

local capital had to be raised. Pending projects to increase ore production from operating units and expand milling capacity were undertaken in 1965. However, output of lead declined slightly owing to the generally declining content of the ores in 1967. In the following year, progress was made in the mine and plant expansion program with completion of a 400 ton per day mill at the Plomosas mine and the new 600 ton per day mill at the San Marton mill. The expansion of the Santa Barbara mill to 2,000 tons per day was expected to be completed in 1969.[44] However, lead production continued to decline in the following two years. Mexican mining industry including the lead mining industry is faced with serious problems. A few of these problems are the obsolescence of the machinery and installations, outmoded processing techniques, and insufficient prospecting schemes.[45] If these problems are solved in addition to the expansion plans, there would be a greater chance to increase the production of minerals, thus increasing the quantity exported.

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[44]U.S. Department of Interior, Bureau of Mines, Minerals Yearbook 1968, printed in 1969, Vol. I-II, p. 640.

[45]Office of the President, Mexican Newsletter, Mexico City, December 31, 1975, Number 58, p. 4.

Venezuela

On August 1, 1489, Venezuela was discovered by Columbus. His report of pearls and gold inspired Amerigo Vespucci and Alonso de Ojeda to explore the Caribbean coast as far as Lake Maracaibo. Venezuela was one of the first colonies to revolt against Spain in 1810, however, it achieved independence in 1821.[46] Venezuela with a population of approximately eight million people,[47] exhibited a traditional agrarian pattern with specialization in export crops such as coffee, cacao, and cattle until the discovery of oil in the early twenties. The critical turning point of the shift to oil was in 1921, when the oil well Los Barros No. 2, on the eastern shores of Lake Maracaibo started production. Venezuela's transition from a traditional, static economy based on agriculture to a more modern and developing economy was triggered by World War II. The disruption of international commerce, during the wartime, had the same impact on Venezuela as elsewhere in Latin America, increasing local production to substitute for imports that were temporarily cut off. Social dualism in

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[46]International Bank for Reconstruction and Development, The Economic Development of Venezuela (Baltimore: The John Hopkins Press, 1961), p. 6.

[47]John Friedman, Venezuela from Doctrine to Dialogue (Syracuse: Syracuse University Press, 1965), p. 4.

Venezuela was characterized by a power elite at the top and a mass of peasants at the bottom. The middle class was the residual category between the oligarchy of large landowners, bankers, importers and military on one hand and the lumpen-proletariat of peasants and unskilled urban workers on the other hand.

Major Economic Problems in Venezuela

Two major economic problems which face Venezuela are the diversification of the country's economic base and achieving interregional balance in the levels of living. The mining and agricultural sectors could carry part of the burden of diversification. But the principal emphasis seems to be on the basic industries oriented toward export markets. The two industrial branches that appear to offer greatest export potential for Venezuela are petrochemicals and basic metallurgy. In both areas, the country has an abundance of the key raw materials, petroleum and natural gas, and iron ore. Previously, these were exported in crude form or largely wasted in the case of natural gas. Vertical integration is now well under way, with a series of petro-chemical plants now under construction and a major iron and steel complex springing up in Guayana.[48] To reduce Venezuela's dependence on imported iron and steel, heavy

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[48] See Lloyd Rodwin and Associates, Planning Urban Growth and Regional Development: The Experience of the Guayana Program of Venezuela (Cambridge: The MIT Press, 1969).

machinery, consumer durables, and chemical products, the import substitution doctrine took place. The government has furnished protection for infant industries through higher tariffs, import licensing and restrictive quotas, to give local manufacturers a captive market for all the goods they could produce. At the same time, manufacturers were allowed to import raw and semi-finished materials, machinery and equipment, free of duty.

The problem of regional balance is due to the fact that population, wealth, and political power were concentrated in the Caracas region. Over the years, national economic planning had been criticized by three groups in Venezuela. The neo-liberals believed that planning should be abolished; the Marxist wanted to eliminate the private sector in favor of planning according to Russia and China; and the centrist groups believed in modifying the order of priorities while at the same time accepting the idea of planning.[49] However, in recent years, the government undertook different national development plans for various purposes. To solve the problem of regional imbalance, the Venezuelan government adopted a "core region" strategy. A core region strategy means that the government is investing large sums to expand a few metropolitan regions such as

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[49]John Friedman, Venezuela from Doctrine to Dialogue, p. 12.

the Guayana and the Valencia Basin.[50]

Petroleum in Venezuela

Venezuela is very closely tied to the world market for petroleum. Venezuela's geographic position is strategically placed to supply oil to the rest of the world. However, only one large producing area, the Middle East, is noted for higher average output per well and lower costs of production.[51]

Petroleum was first produced in Venezuela in 1878, in the vicinity of Rubio, Tachira. Production on a large scale started in 1914 with the discovery of Mene Grande field located on the east side of Lake Maracaibo. However, the boom in output started in 1921 from oil well Los Barros No. 2 also on the eastern side of Lake Maracaibo. The next major discoveries occurred during the periods of 1936 to 1938 when almost all the large fields in eastern Venezuela were discovered. During the last twenty-five years, development

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[50]Lloyd Rodwin and Associates, Planning Urban Growth and Regional Development: The Experience of the Guayana Program of Venezuela, p. 40.

[51]Professor M. A. Adelman found that production costs in 1964 excluding taxes averaging 62 U.S. cents per barrel in Venezuela, 15 cents in Libya, 10 cents in Kuwait and Saudi Arabia, 7 cents in Iran, and only 4 cents in Iraq from Business International, Venezuela Business Problems and Opportunities (New York: Business International, March 1968), p. 25.

and production have continued in all parts of the country without significant new discoveries. The Gulf of Maracaibo is the only place that has not been explored and it is believed to hold substantial resources.[52]

The largest producing crude oil companies in Venezuela are Creole Petroleum Corporation; Shell of Venezuela; Gulf's subsidiary Mene Grande; Venezuela Sun Oil Company; and Mobil Oil of Venezuela. Creole Petroleum Corporation, which is a subsidiary of Standard Oil, produced 37.4% of crude oil in 1965. Shell of Venezuela produced 27.7% of crude production while Mene Grande which is a subsidiary of Gulf produced 11.8% of the crude oil. The Venezuelan Sun Oil Company and Mobil Oil Company of Venezuela produced 6.2% and 4.2% respectively of crude oil. Other foreign owned companies such as Sinclair, Texaco, Chevron, Atlantic, Phillips, Coro, Pet Mar, and Signal produced the remaining 12.7% while the government owned Corporacion Venzolana de Petroleo, established in 1960, produced less than 1% of the total crude oil.[53]

Following the Spanish principle, the Venezuelan constitution declares that hydrocarbons and other subsurface resources are the property of the state. Under the 1943 Hydrocarbons Law, exploration concessions were granted for a three year period. At the end of the three year period

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[52] J. Grunwald and P. Musgrove, Natural Resources in Latin American Development, p. 264.

[53] Business International, Venezuela Business Problems and Opportunities, p. 24.

the exploration area could be converted to a concession for a period of forty years. In return, the concessionaire is subject to an annual levy on the area of exploration, an exploitation tax, royalties on the value of production, a consumption tax on refining and processing and a transportation tax. Concessions that were granted during 1943 and 1944 represent 80% of present production will expire in 1983 and 1984, whereas those which were granted in 1956 and 1957 will expire in 1996-1997.[54] However, no further concessions have been granted since 1959 when Accion Democratica, the minority opposition party, announced that companies would have to employ intensive exploitation in their existing areas, and that a "service contract" between the government and the private companies will be employed after the expiration of the concessions.

The duration of the service contracts will be twenty years but possibly extending to thirty years, while exploitation is limited to twenty percent of the area explored compared to fifty percent for the concession. The purpose of the service contracts were to discourage long run investments. When the service contracts expire, the land and installations revert to the government. Corporacion Venzolana de Petroleo signed two contracts in 1962 with Mene Grande and Mobil Oil, but it was five years later that those contracts were generally accepted.

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[54] Ibid., p. 29.

Until 1969, Accion Democratica was in power. The leader of the Christian Social Party, COPEI, took over from President Romulo Betancourt of the Accion Democratica and was elected for a period of five years. The aim of the new government was to increase government revenue from oil by taxes and regulating prices. By the end of 1970, a new income tax bill was signed. The new bill allowed the government a sixty percent on oil and mining companies' profits compared to the previous income tax rate which ranged from twenty to fifty-two percent.[55]

The second measure of increasing government revenue was determining an optimum value of oil prices. Reference prices were determined by the government for periods not exceeding three years each, however, since December 1972, reference prices have been determined monthly. The Venezuelan government has played a major role in the Organization of Petroleum Exporting Countries, OPEC, whose members include the major Middle East producers in addition to Libya and Indonesia. OPEC has created a degree of solidarity among the member governments, helping them to extract taxes from oil companies, yet it has not prevented the other members from exploiting their natural cost advantage to decrease Venezuela's share of world markets.

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[55] Mostafa F. Hassan, Economic Growth and Employment Problems in Venezuela: An Analysis of an Oil Based Economy (New York: Praeger Publishers, 1975), p. 19.

The previous examination of the economic and historical background of Latin America and of Brazil, Chile, Mexico and Venezuela was designed to provide perspective and better understanding of empirical chapters which follow.

CHAPTER IV

BRAZIL, CHILE, MEXICO, AND VENEZUELA: A STATISTICAL REVIEW OF THE RELATIVE CONTRIBUTION OF IRON, COPPER, LEAD, AND PETROLEUM EXPORTS, AND THE GROWTH RATES, 1950-1971

The purpose of this chapter is to review the iron, copper, lead, and petroleum exports as a percent of GNP and to review also the rates of economic growth of Brazil, Chile, Mexico and Venezuela for the period 1950-1971. The average growth rates of gross national product, per capita income, and the percentage of the specified exports to gross national product will be computed for the period 1950-1960, and 1961-1971 in order to establish whether there has been an increasing or decreasing trend in the four countries. The share of total exports and the share of iron, copper, lead, and petroleum exports to gross national product will be presented first followed by the share of iron, copper, lead, and petroleum exports to total exports. The real growth rates of gross national product and the real growth rates of per capita income will then follow.

Brazil

Brazil is an exporting country of various commodities. The basic exports are coffee, cotton, iron ore,

petroleum and chemicals. The gross national product of Brazil is basically composed of the agricultural, manufacturing, construction and mining sectors. Table 4-1 shows the value of the Brazilian gross national product, total exports, and iron exports in Brazilian new cruizeros.[1]

TABLE 4-1

GROSS NATIONAL PRODUCT, TOTAL EXPORTS AND IRON EXPORTS IN BRAZIL FOR THE PERIOD 1950-1971 IN CURRENT PRICES (BILLIONS OF CRUIZEROS)

Year	Gross National Product	Total Exports	Iron Exports
1950	255.20	25.00	0.10
1951	304.50	33.00	0.20
1952	347.10	26.00	0.40
1953	428.40	32.00	0.50
1954	529.50	43.00	0.40
1955	672.10	55.00	1.20
1956	857.90	60.00	1.80
1957	983.80	61.00	2.60
1958	1,259.60	64.00	2.90
1959	1,698.50	109.00	4.30
1960	2,277.70	147.00	9.50
1961	3,905.00	245.00	15.50
1962	6,367.00	307.00	24.80
1963	11,130.00	550.00	38.40
1964	21,888.00	1,178.00	99.30
1965	34,045.00	2,215.00	190.60
1966	46,050.00	2,880.00	219.70
1967	68,754.00	3,301.00	273.30
1968	96,217.00	4,829.00	349.70
1969	129,518.00	7,752.00	598.50
1970	201,790.00	10,728.00	955.40
1971	269,282.00	14,152.00	1,247.80

Source: GNP figures from Appendix A. International Monetary Fund, International Financial Statistics, 1972, Supplement, Volume 25, pp. 112-115 for figures of total exports and iron exports.

[1]A new cruizero equal to 1,000 old cruizero was introduced on February 13, 1967. See International Monetary Fund, International Financial Statistics, Washington, D.C., February 1974, p. 68.

The Share of Total Exports and Iron Exports to Gross National Product

The value of total Brazilian exports increased from 25.0 billion cruizeros in 1950 to 14,142 billion cruizeros in 1971, in current prices, an increase of 56,568 percent. Gross national product increased from 255.2 billion cruizeros in 1950 to 269,282 billion cruizeros in 1971, in current prices, an increase of 105,518 percent. The share of total exports to the gross national product in Brazil is shown in Table 4-2.

TABLE 4-2

THE SHARE OF TOTAL EXPORTS AND IRON EXPORTS TO GROSS NATIONAL PRODUCT IN BRAZIL FOR THE PERIOD 1950-1971

Year	Total Exports as % of GNP	Iron Exports as % of GNP
1950	9.80	0.04
1951	10.84	0.07
1952	7.49	0.12
1953	7.47	0.12
1954	8.12	0.08
1955	8.18	0.18
1956	6.99	0.21
1957	6.20	0.26
1958	5.08	0.23
1959	6.42	0.25
1960	6.45	0.42
1961	6.27	0.40
1962	4.82	0.39
1963	4.94	0.34
1964	5.38	0.45
1965	6.51	0.56
1966	6.25	0.48
1967	4.80	0.40
1968	5.02	0.36
1969	5.98	0.46
1970	5.32	0.47
1971	5.26	0.46

Source: Computed from data in Table 4-1.

During the period 1950-1971, the share of iron exports in Brazil's gross national product fluctuated between 0.04% in 1950 and 0.56% in 1965. Table 4-2 indicates the percentage of iron exports to gross national product.

The Share of Iron Exports in the Brazilian Total Exports

The value of iron exports in 1950 was 0.1 billion cruizeros, in current prices. In 1971, the value of iron exports rose to 271,741.0 billion cruizeros, in current prices. During the period under study, the share of iron exports in total exports fluctuated between 0.40 percent in 1950 and 8.91 percent in 1970. Table 4-3 indicates the share of iron exports in the Brazilian total exports.

The Rate of Growth of Gross National Product and Per Capita Income

The annual growth rates in real terms are shown in Table 4-4. From the data in Table 4-4, the average real growth rate of gross national product is 6.33% and the average real growth rate of per capita income is 1.86% for the period 1951-1971. For the period 1951-1960, the average real growth rate of gross national product is 3.11% and is 9.25% for the period 1961-1971. The average real growth rate of per capita income for the period 1951-1960 is 0.11% and is 6.29% for the period 1961-1971. The average share of iron exports in gross national product was 0.18%

TABLE 4-3

THE SHARE OF IRON EXPORTS IN THE TOTAL EXPORTS OF BRAZIL FOR THE PERIOD 1950-1971

Year	Iron Exports as % of Total Exports
1950	0.40
1951	0.61
1952	1.54
1953	1.56
1954	0.93
1955	2.18
1956	3.00
1957	4.26
1958	4.53
1959	3.94
1960	6.46
1961	6.33
1962	8.08
1963	6.98
1964	8.43
1965	8.61
1966	7.63
1967	8.28
1968	7.24
1969	7.72
1970	8.91
1971	8.82

Source: Computed from data in Table 4-1.

for the period 1950-1960 and 0.74% for the period 1961-1971 from Table 4-2. This indicates that the growth rates increased during the second period and the percentage share of iron exports to gross national product has also increased during the second period, 1961-1971.

TABLE 4-4

THE RATE OF GROWTH OF GNP AND PER CAPITA INCOME IN BRAZIL FOR THE PERIOD 1951-1971

Year	Annual Real Growth Rate of GNP, Percent	Annual Real Growth Rates of Per Capita Income, Percent
1951	19.32	15.86
1952	-8.80	-11.60
1953	2.85	-0.13
1954	5.94	2.87
1955	-1.28	-4.14
1956	4.44	1.40
1957	-2.97	-7.43
1958	10.96	9.66
1959	1.33	-1.80
1960	-0.67	-3.55
1961	21.82	18.19
1962	6.82	3.61
1963	1.39	-1.68
1964	5.16	1.96
1965	-4.01	-6.95
1966	-7.68	-9.96
1967	15.29	12.05
1968	12.70	9.54
1969	9.22	6.15
1970	30.81	27.15
1971	10.21	7.12

Source: Computed from data in Appendix A and B.

Chile

Chile is basically a copper exporting oountry. However, it does export other products such as meat, wine, iron and gold. The value of the Chilean gross national product, total exports and copper exports has increased over the years. Table 4-5 shows the value of the gross national product, total exports and copper exports in Chilean escudos.[2]

[2]A new currency "escudo" equal to 1000 pesos was introduced in 1955.

TABLE 4-5

GROSS NATIONAL PRODUCT, TOTAL EXPORTS, AND COPPER EXPORTS IN CHILE FOR THE PERIOD 1950-1970 IN CURRENT PRICES (BILLIONS OF ESCUDOS)

Year	Gross National Product	Total Exports	Copper Exports
1950	157.01	20.39	10.19
1951	200.69	34.54	15.55
1952	286.75	58.22	35.79
1953	393.35	90.14	53.02
1954	647.15	126.99	75.74
1955	1,230.91	299.01	202.92
1956	1,739.75	326.55	235.93
1957	2,366.54	354.14	231.53
1958	3,105.44	435.14	272.38
1959	4,123.70	541.00	356.65
1960	4,873.10	582.00	360.89
1961	5,434.00	568.00	354.17
1962	6,574.00	671.00	602.04
1963	9,825.00	1,143.00	813.13
1964	12,382.00	1,644.00	1,186.92
1965	17,152.00	2,515.00	1,738.82
1966	23,640.00	3,894.00	3,010.06
1967	31,503.00	4,931.00	4,114.95
1968	42,459.00	6,649.00	5,590.66
1969	60,177.00	10,339.00	9,710.54
1970	88,821.00	14,591.00	11,132.97

Source: United Nations, Yearbook of International Trade Statistics, 1963, New York, 1965, p. 142 for figures of total exports 1950-1960. Total exports, 1951-1970, from United Nations, Yearbook of National Accounts Statistics, 1964, 1970, and 1973. Figures for copper exports, 1950-1957 from United Nations, Yearbook of International Trade Statistics, issues 1951, 1952, 1955, and 1958. Copper exports figures 1958-1970 from IMF, International Financial Statistics, 1972, Supplement, pp. 118, 119. GNP figures from Appendix C. Copper exports figure for the year 1971 was unavailable.

The Share of Total Exports and Copper Exports to Gross National Product

The value of total exports in Chile increased from 20.39 billion escudos in 1950 to 14,591 billion escudos in 1970 in current prices. Gross national product increased from 157.01 billion escudos in 1950 to 88,821 billion escudos in 1970. Table 4-6 shows the share of total exports to the gross national product in Chile.

TABLE 4-6

THE SHARE OF TOTAL EXPORTS AND COPPER EXPORTS TO GROSS NATIONAL PRODUCT IN CHILE FOR THE PERIOD 1950-1970

Year	Total Exports as % of GNP	Copper Exports as % of GNP
1950	12.99	6.49
1951	17.21	7.74
1952	20.30	12.48
1953	22.92	13.48
1954	19.62	11.70
1955	24.29	16.48
1956	18.77	13.56
1957	14.96	9.78
1958	14.01	8.77
1959	13.11	8.65
1960	11.95	7.40
1961	10.45	6.52
1962	10.21	9.16
1963	11.63	8.28
1964	13.28	9.59
1965	14.66	10.14
1966	16.47	12.73
1967	15.65	13.06
1968	15.66	13.17
1969	17.18	16.14
1970	16.43	12.53

Source: Computed from data in Table 4-5.

During the period 1950-1970, the share of copper exports in Chile's gross national product fluctuated between 6.49% in 1950 and 16.48% in 1955. Table 4-6 shows the percentage of copper exports to gross national product

The Share of Copper Exports in the Chilean Total Exports

The value of copper exports in 1950 was 10.19 billion escudos, and 11,132.97 billion escudos in 1970. The share of copper exports in total exports is shown in Table 4-7.

TABLE 4-7

THE SHARE OF COPPER EXPORTS IN THE TOTAL EXPORTS OF CHILE FOR THE PERIOD 1950-1970

Year	Copper Exports as % of Total Exports
1950	49.98
1951	45.00
1952	61.48
1953	58.82
1954	59.64
1955	67.86
1956	72.25
1957	65.38
1958	62.60
1959	65.92
1960	61.98
1961	62.35
1962	89.72
1963	71.14
1964	72.20
1965	69.14
1966	77.30
1967	83.45
1968	84.08
1969	93.92
1970	76.30

Source: Computed from data in Table 4-5.

The Rate of Growth of Gross National Product and Per Capita Income

The annual growth rates calculated in real terms are shown in Table 4-8. From the data in Table 4-8, the average real growth rate of gross national product is 5.76% and the average real growth rate of per capita income is 3.75% for the period 1951-1970. For the period 1951-1960, the average real growth rate of gross national product is 5.39% and is 5.94% for the period 1961-1970. The average real growth rate of per capita income for the period 1951-1960 is 4.64% and is 4.57% for the period 1961-1971. The average share of copper exports in gross national product was 10.59% for the period 1950-1960 and 11.13% for the period 1961-1970, from Table 4-6. This indicates that the growth rates increased during the second period except for the per capita income growth rates, and that the percentage share of copper exports to gross national product has also increased during the period 1961-1970.

Mexico

Mexico exports food products such as fish, wheat, fruits, nuts, honey, beverages and tobacco. Mexico exports minerals such as copper, iron, zinc, and manganese in addition to lead. The gross national product of Mexico is composed of the agricultural, manufacturing, construction

TABLE 4-8

THE RATE OF GROWTH OF GNP AND PER CAPITA INCOME IN CHILE FOR THE PERIOD 1951-1970

Year	Annual Real Growth Rates of GNP, Percent	Annual Real Growth Rates of Per Capita Income, Percent
1951	27.82	25.50
1952	7.16	5.16
1953	9.74	7.04
1954	2.83	0.31
1955	1.44	-1.05
1956	-7.82	-10.09
1957	7.88	5.24
1958	2.85	0.03
1959	-3.66	-6.02
1960	5.73	3.13
1961	4.20	1.96
1962	6.95	4.67
1963	3.12	0.76
1964	-13.68	-16.48
1965	7.58	6.63
1966	12.17	7.70
1967	12.76	10.10
1968	6.65	4.21
1969	8.42	5.98
1970	11.32	20.19

Source: Computed from data in Appendix C and D.

and mining sectors. Table 4-9 shows the value of the Mexican gross national product, total exports, and lead exports in Mexican pesos.

The Share of Total Exports and Lead Exports to Gross National Product

The value of Mexican exports increased from 87,773 million pesos in 1952 to 34,200 million pesos in 1970, in current prices. The gross national product also increased

TABLE 4-9

GROSS NATIONAL PRODUCT, TOTAL EXPORTS, AND LEAD EXPORTS IN MEXICO FOR THE PERIOD 1952-1971 IN CURRENT PRICES (MILLIONS OF MEXICAN PESOS)

Year	Gross National Product	Total Exports	Lead Exports
1952	57,597	8,773	657
1953	56,017	8,366	507
1954	62,519	11,411	658
1955	80,655	16,282	722
1956	90,237	18,075	667
1957	114,300	15,200	603
1958	127,000	15,300	439
1959	136,200	15,900	424
1960	154,100	16,600	420
1961	163,800	17,800	465
1962	177,600	19,400	328
1963	192,200	20,900	345
1964	223,200	22,400	296
1965	244,700	24,700	351
1966	274,500	26,900	345
1967	304,300	27,000	300
1968	332,900	28,300	283
1969	374,900	32,700	285
1970	423,200	34,200	327
1971	452,800	36,600	239

Source: United Nations, Yearbook of National Accounts Statistics, various issues for total export figures. Figures for lead exports from IMF, International Financial Statistics, 1972 Supplement, pp. 154, 155. GNP figures from Appendix E. GNP figure for 1950 and 1951 were unavailable.

from 57,597 million pesos in 1952 to 452,800 million pesos in 1971, in current prices. The share of total exports to the gross national product in Mexico is shown in Table 4-10. The share of lead exports in Mexico's gross national product fluctuated between 1.15% in 1952 and 0.05% in 1971. Table 4-10 indicates the percentage of lead exports to gross national product.

TABLE 4-10

THE SHARE OF TOTAL EXPORTS AND LEAD EXPORTS TO GROSS NATIONAL PRODUCT IN MEXICO FOR THE PERIOD 1952-1971

Year	Total Exports as % of GNP	Lead Exports as % of GNP
1952	15.23	1.15
1953	14.93	0.91
1954	18.25	1.05
1955	20.19	0.89
1956	20.03	0.74
1957	13.30	0.53
1958	12.05	0.35
1959	11.67	0.31
1960	10.77	0.27
1961	10.87	0.28
1962	10.92	0.18
1963	10.87	0.18
1964	10.04	0.13
1965	10.09	0.14
1966	9.80	0.13
1967	8.87	0.10
1968	8.50	0.08
1969	8.72	0.07
1970	8.08	0.08
1971	8.08	0.05

Source: Computed from data in Table 4-9.

The Share of Lead Exports in the Mexican Total Exports

The value of lead exports was 657 million pesos in 1952 but dropped to 239 million pesos in 1970. The share of lead exports in the Mexican total exports is shown in Table 4-11.

TABLE 4-11

THE SHARE OF LEAD EXPORTS IN THE TOTAL EXPORTS OF MEXICO FOR THE PERIOD 1952-1970

Year	Lead Exports as % of Total Exports
1952	7.49
1953	6.06
1954	5.77
1955	6.10
1956	3.69
1957	3.97
1958	2.87
1959	2.67
1960	2.53
1961	2.61
1962	1.69
1963	1.65
1964	1.32
1965	1.42
1966	1.28
1967	1.11
1968	1.00
1969	0.87
1970	0.96
1971	0.65

Source: Computed from data in Table 4-9.

The Rate of Growth of Gross National Product and Per Capita Income

The annual real growth rates for the Mexican economy for the periods 1953-1970 is shown in Table 4-12. From the data in Table 4-12, the average real growth rate of gross national product is 7.21% and the average real growth rate of per capita income is 3.78% for the period 1953-1970. For the period 1953-1960, the average real growth rate of gross national product is 6.91% and is 7.42% for the period 1961-1970. The average real growth rate of

per capita income for the period 1953-1960 is 3.70% and is 3.83% for the period 1961-1970. The average share of lead exports in gross national product was 0.69% for the period 1952-1960 but decreased to 0.13% for the period 1961-1971 from Table 4-10. This indicates that the growth rates increased during the second period but the percentage share of lead exports to gross national product decreased during the second period, 1961-1971.

TABLE 4-12

THE RATE OF GROWTH OF GNP AND PER CAPITA INCOME IN MEXICO FOR THE PERIOD 1953-1970

Year	Annual Real Growth Rates of GNP, Percent	Annual Real Growth Rates of Per Capita Income, Percent
1953	-1.12	-4.05
1954	6.44	3.26
1955	11.26	7.94
1956	7.02	3.81
1957	20.18	16.57
1958	-1.01	-3.98
1959	4.68	1.49
1960	7.87	4.59
1961	4.46	1.27
1962	7.22	3.94
1963	7.57	4.25
1964	13.63	10.11
1965	5.80	2.52
1966	7.51	2.78
1967	7.64	4.05
1968	6.96	3.36
1969	9.15	5.44
1970	7.85	4.18

Source: Computed from data in Appendix E and F.

Venezuela

Venezuela is basically a petroleum crude exporting country. Venezuela exports petroleum products such as motor spirit, lamp oil, white spirit, gas, diesel and other fuel oils, and lubricating oils and grease in addition to cocoa beans and coffee. Table 4-13 shows the value of the Venezuelan gross national product, total exports and petroleum exports in current prices.

The Share of Total Exports and Petroleum Exports to Gross National Product

Total exports in Venezuela increased from 3,619 million bolivares in 1950 to 14,920 million bolivares in 1971, in current prices. This accounted for an increase of 412.3 percent. Gross national product increased from 8,429 million bolivares in 1950 to 48,670 million bolivares in 1971, in current prices, an increase of 577.4 percent. The share of total exports to the gross national product in Venezuela is shown in Table 4-14. The share of petroleum exports in Venezuela's gross national product, during the period 1950-1971, fluctuated between 41.66% in 1957 and 24.35% in 1970. The percentage of petroleum exports to gross national product for Venezuela is shown in Table 4-14.

TABLE 4-13

GROSS NATIONAL PRODUCT, TOTAL EXPORTS, AND PETROLEUM EXPORTS IN VENEZUELA FOR THE PERIOD 1950-1971 IN CURRENT PRICES (MILLIONS OF BOLIVARES)

Year	Gross National Product	Total Exports	Petroleum Exports
1950	8,429	3,619	3,356
1951	9,452	4,182	3,798
1952	11,732	4,512	4,208
1953	12,632	4,709	4,398
1954	14,069	5,197	4,797
1955	15,287	5,914	5,491
1956	16,658	6,905	6,349
1957	18,880	8,521	7,865
1958	22,108	7,288	7,099
1959	23,382	7,803	6,654
1960	23,533	8,112	6,642
1961	23,232	8,628	6,809
1962	24,288	9,145	7,221
1963	26,445	9,490	7,218
1964	31,047	11,382	10,138
1965	33,507	11,648	10,144
1966	35,668	11,282	9,746
1967	37,836	11,976	10,266
1968	40,294	12,134	10,364
1969	42,937	12,106	10,145
1970	43,330	12,760	10,549
1971	48,670	14,920	12,691

Source: Figures for total exports: IMF, International Financial Statistics, January 1961 for 1960 and 1961 data. Data for 1952-1971 from United Nations, Yearbook of National Accounts, various issues. Figures for Petroleum exports from IMF International Financial Statistics, 1972 Supplement, pp. 178, 179. Figures for GNP from Appendix G.

The Share of Petroleum Exports in the Venezuelan Total Exports

The value of petroleum exports increased from 3,356 million bolivares in 1950 to 12,691 million bolivares in 1971, an increase of 378.2 percent. During the period

TABLE 4-14

THE SHARE OF TOTAL EXPORTS AND PETROLEUM EXPORTS TO GROSS NATIONAL PRODUCT IN VENEZUELA FOR THE PERIOD 1950-1971

Year	Total Exports as % of GNP	Petroleum Exports as % of GNP
1950	42.93	39.81
1951	44.24	40.18
1952	38.46	35.87
1953	37.28	34.82
1954	36.94	34.96
1955	26.72	35.92
1956	30.36	38.11
1957	45.13	41.66
1958	32.59	32.11
1959	33.37	28.46
1960	34.47	28.22
1961	37.14	29.31
1962	37.65	29.73
1963	35.88	27.29
1964	36.66	32.65
1965	34.76	30.27
1966	31.63	27.32
1967	31.65	27.13
1968	30.11	25.72
1969	28.19	23.63
1970	29.45	24.35
1971	30.66	26.08

Source: Computed from data in Table 4-13.

under study, the petroleum constituted 92.73% of the total exports in 1950 and 85.06% of the total exports in 1971. Table 4-15 shows the share of petroleum exports to the total exports of Venezuela for the period 1950-1971.

TABLE 4-15

THE SHARE OF PETROLEUM EXPORTS IN THE TOTAL EXPORTS OF VENEZUELA FOR THE PERIOD 1950-1971

Year	Petroleum Exports as % of Total Exports
1950	92.73
1951	80.82
1952	93.26
1953	93.40
1954	92.30
1955	92.85
1956	91.95
1957	92.23
1958	97.41
1959	85.27
1960	81.88
1961	78.92
1962	78.96
1963	76.06
1964	89.07
1965	87.09
1966	86.38
1967	85.72
1968	85.41
1969	83.80
1970	82.67
1971	85.06

Source: Computed from data in Table 4-13.

The Rate of Growth of Gross National Product and Per Capita Income

The annual real growth rates for the Venezuelan economy is shown in Table 4-16. From the data in Table 4-16, the average real growth rate of gross national product is 7.57% and the average real growth rates of per capita income is 3.51% for the period 1951-1971. For the period 1951-1960, the average real growth rate of gross national product is 9.69% and is 5.65% for the period

TABLE 4-16

THE RATE OF GROWTH OF GNP AND PER CAPITA INCOME IN VENEZUELA FOR THE PERIOD 1951-1971

Year	Annual Real Growth Rates of GNP, Percent	Annual Real Growth Rates of Per Capita Income, Percent
1951	4.74	0.06
1952	22.64	17.17
1953	9.09	3.94
1954	11.25	6.69
1955	9.14	4.86
1956	8.02	3.90
1957	15.74	11.48
1958	11.62	7.68
1959	7.27	-2.72
1960	-2.61	-5.80
1961	1.40	-1.92
1962	4.97	1.50
1963	7.68	4.10
1964	14.98	11.12
1965	6.05	2.49
1966	4.73	1.14
1967	5.98	2.38
1968	5.10	1.38
1969	4.03	4.38
1970	-1.51	-4.95
1971	8.74	4.94

Source: Computed from data in Appendix H.

1961-1971. The average real growth rate of per capita income for the period 1951-1960 is 4.72% and is 2.41% for the period 1961-1971. The average share of petroleum exports in gross national product was 31.85% for the period 1950-1960 and 27.59% for the period 1961-1971, from Table 4-14. This indicates that the growth rates decreased during the second period and the percentage share of iron exports to gross national product has also decreased during the second period 1961-1971.

Summary

The main objective of this chapter was to show whether the growth rates and the share of iron, copper, lead and petroleum exports in gross national product followed the same trend. The direction of the trend of the growth rates and the share of the specified exports in gross national product might throw some insights on the effect of the specified exports on the endogenous variables in the next chapter. An increasing or decreasing trend in both the growth rates and the share of the specified exports might be an indication of a positive impact of the exogeneous variable on the endogenous variables. An increasing trend in the growth rates but a decreasing trend in the share of the specified exports in GNP might be an indication of a negative impact of the specified exports on the endogenous in the direct model, and vice versa. The following information summarizes the findings.

	Annual Real Growth Rates of GNP, %		Annual Real Growth Rates of Per Capita Income, %		Share of the Specified Exports in GNP, %	
	1950-1960 First Period	1961-1971 Second Period	1950-1960 First Period	1961-1971 Second Period	1950-1960 First Period	1961-1971 Second Period
Brazil	3.11	9.25	0.11	6.29	0.18	0.74
Chile	5.39	5.94	4.64	4.57	10.59	11.13
Mexico	6.91	7.42	3.70	3.83	0.69	0.13
Venezuela	9.69	5.65	4.72	2.41	31.85	27.59

Brazil experienced an increasing trend in both the growth rates and the share of iron exports in GNP, while Venezuela experienced a decreasing trend. Chile experienced an increasing trend in the growth rate of GNP and the share of copper exports in GNP but a decreasing trend in the growth rates of per capita income. Mexico experienced an increasing trend in both categories of the growth rates but a decreasing trend in the share of lead exports in gross national product.

CHAPTER V

THE DIRECT IMPACT OF THE SPECIFIED EXPORTS ON THE ECONOMIES OF BRAZIL, CHILE, MEXICO, AND VENEZUELA

The purpose of this chapter is to determine the contribution of the exogeneous variable on the macroeconomic variables selected for this study. The hypothesis to be tested is that there is no direct positive impact of iron, copper, lead and petroleum exports on the Brazilian, Chilean, Mexican and Venezuelan economy with regards to several endogenous variables. The test employed was a simple linear regression analysis. For the estimated equations, the sample consists of yearly observations.

To test the significance of the regression coefficient, the F test was used. The coefficient of determination, R^2, measures the amount of improvement due to the regression line by measuring the reduction in the total sum of squares. It also measures the closeness of fit of the regression line to the observations, and measures

the degree of linearity. When R^2 is close to 1, it indicates that the scatter of the observations of the dependent variable is closer to the fit of the regression line and resembles a straight line, and vice versa when R^2 is close to zero.

To test for the presence of auto-correlation between the endogenous and exogenous variables, the Durbin Watson statistic was calculated. This measurement can assume values from zero to four. Tables of critical values of the Durbin Watson statistic show that if the calculated disturbance, d, is less than the lower limit of the Durbin Watson Statistic positive serial auto-correlation is indicated. If the calculated disturbance, d, is greater than the upper limit of the Durbin Watson statistic absence of positive serial auto-correlation is indicated. If the calculated disturbance is between the lower and upper limits of the critical values of the Durbin Watson statistic the procedure is inconclusive.[1]

The two models in this study are similar to the

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[1]J. Johnston, Econometric Models (New York: McGraw-Hill Book Company, 1972), pp. 250-252.

models by Lawrence Klein,[2] the Peruvian model by Eric Thorbecke and Apostolos Condos,[3] and the Iranian model by Fardi.[4] The model is a demand oriented model. Due to the unavailability of data no attempt was made to include the labor and money markets in the model. The model used to show the direct contribution of iron, copper, lead, and petroleum exports on the economies of Brazil, Chile, Mexico and Venezuela respectively was formulated so that the iron, copper, lead, and petroleum export was the exogenous variable. The direct model consists of the following fitted equations:

$$Y_i = a_i + b_i X \qquad (i = 1,2, \ldots, 10)$$

where: Y_1 = Private Consumption

Y_2 = Government Consumption

Y_3 = Investment

Y_4 = Total Imports

Y_5 = Exports of Non-Mineral

Y_6 = Direct Taxes

Y_7 = Indirect Taxes

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[2]Lawrence Klein and J. Behrman, "Economic Growth Models for the Developing Economy" in Induction Growth and Trade by W. Eltis, M. Scott and J. Wolfe, ed. (Oxford: Clarendon Press, 1970), pp. 165-187 and L. R. Klein, "What Kind of Macroeconometric Model for Developing Economies?" in Readings in Economic Statistics and Econometrics, A. Zellner, ed. (Boston: Little Brown & Co., 1968), pp. 559-570.

[3]Eric Thorbecke and A. Condos, "Macroeconomic Growth and Development Models of the Peruvian Economy," in The Theory and Design of Economic Development, by Adelman and Thorbecke, eds. (Baltimore: John Hopkins University Press, 1970), pp. 181-209.

[4]M. Fardi, "A Macroeconomic Analysis of a Petroleum Export Economy: Iran as a Case" (Ph.D. dissertation, University of Illinois at Urbana-Champaign, 1972).

Y_8 = Defense
Y_9 = Education
Y_{10}= Social services including health

In such equations X is the major export of the particular country, and the a_i and b_i were estimated via least squares. The results of the simple regression analysis for Brazil, Chile, Mexico, and Venezuela is presented below.

Brazil

The impact of iron export on private consumption, government consumption, investment, imports, exports of non-lead, direct taxes, indirect taxes, defense education and health was shown by a simple regression test for the period 1950-1971.[5]

The Effects of Iron Exports on Consumption

To measure the impact of iron exports on private consumption, a regression test was performed with the following results:

Private Consumption = 148.75 + 154.72 (Iron Export)

R^2 = 0.99221 F = 2548.26 DW = 1.11

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[5]The degrees of freedom for the regression equations computed for the period 1950-1971 are 1,20. The critical F value is 4.35 for the 95% significance level. Durbin Watson statistic significance points for 22 observations and a 99% significance level is 1.00-1.17.

The correlation coefficient is positive and statistically significant and the impact of iron exports on private consumption appears to be very large. The value of the regression coefficient indicates that an increase of one Brazilian cruizero will increase private consumption by approximately 155 cruizeros. The coefficient of determination was found to be large and indicates a 99.2% reduction in the total sum of squares. The calculated Durbin Watson statistic indicates that it is inconclusive.

The regression equation for government consumption was

Government Consumption = 50.17 + 22.15 (Iron Export)

$R^2 = 0.98036$ F = 998.20 DW = 0.68

The correlation coefficient is positive and statistically significant.

The Effects of Iron Exports on Investment

To measure the impact of iron exports on investment, a regression test was performed with the following results

Investment = -45.07 + 45.72 (Iron Export)

$R^2 = 0.98967$ F = 1915.61 DW = 1.7

The coefficient of determination was found to be very high and the F test highly significant. The correlation coefficient is positive and the value of the regression coefficient indicates that an increase of one cruizero in exports leads to an increase of 45.7 cruizeros in investments.

The Effects of Iron Exports on Trade

The impact of iron exports on total imports was tested by the following regression equation.

Total Imports = 8.67 + 16.42 (Iron Exports)

R^2 = 0.99038 F = 2059.84 DW = 2.01

The correlation coefficient is positive and highly significant. The value of the regression coefficient indicates that an increase of one cruizero in iron exports leads to an increase of 16.4 Brazilian cruizeros in total imports. The coefficient of determination was found to be high.

To measure the impact of iron exports on the total exports including iron exports, a regression test showed the following results:

Exports of Non-Iron = 10.69 + 10.50 (Iron Export)

R^2 = 0.99454 F = 3644.78 DW = 1.3

The coefficient of determination is higher than the coefficient of determination for total imports. The F test proved to be highly significant and the correlation coefficient is positive. The value of the regression coefficient indicates that an increase of one cruizero in iron exports leads to an increase of 10.5 cruizeros in non-iron exports.

The Effect of Iron Exports on Taxes

The direct taxes in Brazil are mainly from taxes on income and wealth including capital gains taxes. To measure the impact of iron exports on direct taxes a regression equation was estimated as follows:

Direct Taxes = 4.57 + 5.32 (Iron Export)

R^2 = 0.99281 F = 2762.24 DW = 1.5

The correlation coefficient is positive and its value indicates that an increase of one Brazilian cruziro in iron exports will lead to an increase of 5.3 cruizeros in direct taxes. The F statistic indicates that it is highly significant. The coefficient of determination indicates that there has been a 99.3% reduction in the total sum of squares or total error and that the fit of the regression line is very close to the points of the endogenous variable.

The indirect taxes in Brazil are composed of custom duties, excise, stamp duties, and tax on foreign exchange operation. The impact of iron exports on indirect taxes was tested by the following regression equation:

Indirect Taxes = 5.95 + 15.10 (Iron Export)

R^2 = 0.98051 F = 1006.01 DW = 1.73

The coefficient of determination indicated a close fit of the regression line to the observations of the endogenous variable. The correlation coefficient is positive and the impact of iron exports on indirect taxes is large. The F statistic proved to be highly significant.

The Effect of Iron Exports on Budget Expenditure

The Brazilian accounts expenditure are composed mainly of public debt service, defense, education, and health. The impact of iron exports on defense, education, and health was measured. To measure the impact of iron

exports on the defense, education and health expenditure, the regression equations were estimated respectively as follows:

Defense = 6.65 + 5.01 (Iron Export)

R^2 = 0.96553 F = 560.21 DW = 1.70

Education = 26.62 + 1.55 (Iron Export)

R^2 = 0.92529 F = 123.85

Health = 10.30 + 0.35 (Iron Export)

R^2 = 0.74530 F = 29.26

The above equations indicate a positive relationship between iron exports and defense, education and health. Data for education and health was available for the period 1960-1971 only.[6]

Summary

The value of the regression coefficient indicated a positive relationship between the endogenous and the exogenous variables. The value of the regression coefficient also indicated a large impact of iron exports on the endogenous variables. The largest impact was on private consumption where the regression coefficient was 154.7. The smallest impact was on health where the value of the regression coefficient was 0.35. The coefficient of determination was high for all the above equations. The F

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[6]The critical F value of 10.04 or above is statistically significant for 99% significance level for 1,10 degrees of freedom. The Durbin Watson test was not performed due to the small number of observations.

statistic indicated that the above equations are statistically significant.

Chile

To measure the impact of copper export on private consumption, government consumption, investment, direct taxes, indirect taxes, imports, exports of non-copper, defense, education, and social services, a simple regression test was used for the period 1950-1970.[7]

The Effects of Copper Exports on Consumption

The regression equation for private consumption was:

Private Consumption = 124.73 + 5.21 (Copper Exports)

R^2 = 0.98046 F = 953.19 DW = 2.13

The correlation coefficient is positive and statistically significant, and the impact of copper exports on private consumption appear to be large. The value of the regression coefficient indicates that an increase of one Chilean peso in copper exports leads to an increase of 5.21 Chilean escudos in private consumption. The coefficient of determination was found to be high.

To measure the impact of copper export on government consumption, a regression test was performed with the following results:

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[7]The period covered is 1950-1970, thus the degrees of freedom are 1,19. The critical F value of 4.38 or above is statistically significant for a 95% significance level. Durbin Watson critical values for 21 observations and a 99% level of significance is 0.97-1.16.

Government Consumption = 4.10 + 0.96 (Copper Export)

R^2 = 0.95957 F = 450.92 DW = 2.39

The coefficient determination is high and the F test is statistically significant. The value of the regression coefficient is not as high as the one associated with private consumption. The value of the regression coefficient indicates that an increase of one Chilean escudo in copper exports leads to an increase of 0.96 Chilean peso in government consumption.

The Effects of Copper Exports on Investment

The impact of copper exports on investments was measured by the following regression equation:

Investment = 13.46 + 1.13 (Copper Export)

R^2 = 0.97778 F = 836.13 DW = 2.24

The coefficient of determination was found to be very high and the F test highly significant. The correlation coefficient is positive and its value indicates that an increase of one Chilean escudo in copper exports leads to an increase of 1.13 escudos in investments.

The Effects of Copper Exports on Trade

To measure the impact of copper exports on imports, a regression test was performed with the following results:

Total Imports = 7.62 + 1.13 (Copper Export)

R^2 = 0.97117 F = 640.04 DW = 2.35

The correlation coefficient is positive and statistically

significant and the impact of copper exports on total imports appears to be large. The value of the regression coefficient indicates that an increase of one Chilean escudo in copper exports leads to an increase of 1.13 Chilean escudos in total imports. The coefficient of determination was also found to be high.

The impact of copper exports on total exports excluding copper can be estimated by the following regression equation:

Total Exports of Non-Copper = 8.46 + 0.20 (Copper Export)

R^2 = 0.69422 F = 43.14 DW = 2.35

The coefficient of determination was found to be the lowest in this case. The regression coefficient is positive and statistically significant, but the impact of copper exports was found to be small.

The Effects of Copper Exports on Taxes

The direct taxes were mainly taxes on income and wealth. To measure the impact of copper exports on direct taxes, a regression equation was estimated as follows:

Direct Taxes = 0.66 + 0.62 (Copper Export)

R^2 = 0.97930 F = 898.85 DW = 2.33

The correlation coefficient is positive and the regression equation indicates a strong relationship between copper exports and direct taxes. The value of the regression coefficient indicates that an increase of one Chilean escudo in copper exports leads to an increase of 0.62 Chilean escudo in direct taxes. The F test indicates that it is statistically

significant and the coefficient of determination is very high.

The indirect taxes in Chile were divided into custom duties, excise tax, and stamp duties. The impact of copper exports on indirect taxes were measured by a regression test which indicated the following results:

Indirect Taxes = 0.45 + 0.82 (Copper Export)

R^2 = 0.98597 F = 1335.37 DW = 2.47

The coefficient of determination for the above equation was the highest compared to the determination coefficients of the other equations pertaining to the model. The F test indicates that it is statistically significant. The correlation coefficient is positive and the value of the regression coefficient indicates that there is a large impact of copper exports on indirect taxes.

The Effects of Copper Exports on Budget Expenditures

Budget expenditures in Chile were divided into defense, education, social security, public debt service and other expenditures. The impact of defense, education and social services including health were measured by the following regression equations:

Defense = 1.48 + 0.17 (Copper Export)

R^2 = 0.94560 F = 330.25 DW = 2.20

Education = -1.41 + 0.30 (Copper Exports)

R^2 = 0.97400 F = 711.81 DW = 2.44

Social Services Including Health = 2.55 + 0.13 (Copper Exports)

R^2 = 0.96039 F = 460.72 DW = 2.15

The coefficient of determination is high and the F test is

significant for the above three equations. However, the regression coefficient indicates that the impact of copper exports on defense, education and social services is small.

Summary

There appears to be a positive impact of copper exports on all the above endogenous variables. There was a large impact on all the variables except for total exports excluding copper and defense, education, and social services on which there was a small impact. The coefficient of determination was found to be high and the F test was statistically significant.

Mexico

The impact of lead exports on the endogenous variables, private consumption, government consumption, imports, total exports excluding lead, direct taxes, indirect taxes, defense, education and social services was measured by a simple regression test for the period 1952-1970.[8] It has been noticed, from the collected data, that lead exports started declining since 1955 while all the other variables increased.

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[8]The degrees of freedom for the period 1952-1970 is 1,17. The critical F value of 4.45 or above is statistically significant for 95% level of significance. The critical values of the Durbin Watson statistic for 19 observations and 99% level of significance is 0.93-1.13.

The Effects of Lead Exports on Consumption

The impact of lead exports on private consumption was estimated by a regression test. The regression equation for the relationship between private consumption and lead exports was as follows:

Private Consumption = 35.21 - 458.26 (Lead Export)

R^2 = 0.68511 F = 37.00 DW = 0.69

The correlation coefficient is negative which indicates an inverse relationship between the endogenous variable and the exogenous variable, and is statistically significant. However, the value of the regression coefficient indicates a large impact. The value indicates that an increase of one Mexican peso in lead exports will decrease private consumption by 458.26 Mexican pesos. The coefficient of determination is high.

To measure the impact of lead exports on government consumption, a regression test was performed with the following results:

Government Consumption = 9.04 - 147.24 (Lead Export)

R^2 = 0.11656 F = 2.24 DW = 2.04

The correlation coefficient is negative indicating an inverse relationship between lead exports and government consumption and is not statistically significant. The value of the regression coefficient indicates a large negative impact.

The Effects of Lead Exports on Investment

By regressing lead exports on investments, the following regression equation was estimated:

Investment = 23.09 - 372.10 (Lead Export)

R^2 = 0.11838 F = 2.28 DW = 2.06

The correlation coefficient is negative indicating an inverse relationship between lead exports and investments. Neither the regression coefficient nor the amount of variance explained was statistically significant.

The Effects of Lead Exports on Trade

To test the impact of lead exports on imports, a simple regression test was performed indicating the following results:

Imports = 11.55 - 173.48 (Lead Export)

R^2 = 0.10794 F = 2.06 DW = 2.10

The correlation coefficient is negative and not statistically significant. The amount of variance explained was not statistically significant.

By regressing lead exports on non-lead exports, the following equation was estimated:

Non-Lead Exports = 3.62 - 37.59 (Lead Export)

R^2 = 0.55262 F = 20.99 DW = 0.66

The correlation coefficient is negative. The regression coefficient and the amount of variance explained was statistically significant.

The Effects of Lead Exports on Taxes

The impact of lead exports on direct taxes and indirect taxes in Mexico was estimated by the following equations:

Direct Taxes = 1.41 - 19.68 (Lead Exports)

R^2 = 0.60932 F = 26.51 DW = 0.60

Indirect Taxes = 1.44 - 16.01 (Lead Export)

R^2 = 0.61059 F = 26.66 DW = 1.43

The correlation coefficient for the above equations are negative, and statistically significant. The value of the regression coefficient indicates a strong negative impact.

The Effects of Lead Exports on Budget Expenditure

Regressing lead exports on defense, education and social services including health, the following equations were estimated:

Defense = 0.32 - 4.17 (Lead Exports)

R^2 = 0.69162 F = 38.13 DW = 0.66

Education = 0.82 - 11.94 (Lead Exports)

R^2 = 0.63860 F = 30.04 DW = 0.55

Social Services Including Health = 0.47 - 6.82 (Lead Exports)

R^2 = 0.71120 F = 41.86 DW = 0.84

The correlation coefficients are negative. The regression coefficients and the amount of variance explained were statistically significant.

Summary

The results of the Mexican simple regression model indicated an inverse relationship between the lead exports and all the endogenous variables in the model. This could be attributed to the decline in the value of the Mexican lead exports sinxe 1955. The F statistic indicates that the endogenous variables and the exogenous variables are statistically significant with the exception of government consumption, investments and imports.

Venezuela

The impact of petroleum exports on the endogenous variables private consumption, government consumption, investment, imports, non-petroleum exports, direct taxes, indirect taxes, defense and education in Venezuela was shown by a simple regression test for the period 1950-1971. Data for social services including health was available for 1950-1954, and 1960-1971.[9]

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[9]The degrees of freedom for the period 1950-1971 is 1,20. The critical value is 4.35 for the 95% significance level. The critical values for the Durbin Watson test for 22 observations and 99% level of significance is 1.00-1.17. The endogenous variable, social services was observed for the period 1950-1954 and 1960-1971, thus the degrees of freedom is 1,15. The critical F value is 4.45 for the 95% significance level. The critical values of the Durbin Watson test for 17 observations and 99% level of significance is 1.01-1.25.

The Effects of Petroleum Exports on Consumption

To measure the impact of petroleum exports on Venezuelan private consumption, a regression test was performed with the following results:

Private Consumption = -0.34 + 2.60 (Petroleum Export)

R^2 = 0.92469 F = 245.57 DW = 1.44

The correlation coefficient is positive which indicates that there is a direct relationship between the endogenous and the exogenous variables. The regression coefficient and the amount of variance explained are significant.

The impact of petroleum exports on government consumption in Venezuela was measured by the following regression equation:

Government Consumption = -0.17 + 0.72 (Petroleum Export)

R^2 = 0.88070 F = 147.64 DW = 0.81

The correlation coefficient is positive indicating a relationship between government consumption and petroleum exports. The regression coefficient and the amount of variance explained are statistically significant.

The Effects of Petroleum Exports on Investment

The impact of petroleum exports on investments in Venezuela was measured by the following regression equation:

Investment = -0.15 + 0.98 (Petroleum Export)

R^2 = 0.87027 F = 134.16 DW = 0.59

The correlation coefficient indicated a positive impact of the exogenous variable on the endogenous variable. The

regression coefficient and the amount of variance explained are statistically significant. The coefficient of determination is high.

The Effects of Petroleum Exports on Trade

To measure the impact of petroleum exports on imports in Venezuela, a regression test indicated the following results:

Imports = -0.0 + 0.86 (Petroleum Exports)

R^2 = 0.87648 F = 141.92 DW = 0.65

The correlation coefficient is positive and the value of the regression coefficient indicates that an increase of one Venezuelan bolivare in petroleum exports will lead to an increase of 0.86 bolivare in total imports.

The impact of petroleum exports on non-petroleum exports was tested by the following regression equation:

Non-Petroleum Exports = -0.04 + 0.22 (Petroleum Export)

R^2 = 0.58069 F = 27.70 DW = 0.97

The correlation coefficient is positive and the value of the regression coefficient indicates that an increase of one Venezuelan bolivare in petroleum exports will lead to an increase of 0.22 bolivare of non-petroleum exports. The coefficient of determination is the one which indicates whether the scatter of the observation points resembles a straight line. The coefficient of determination indicates that there has been a 58.1% reduction in the total sum of squares.

The Effects of Petroleum Exports on Taxes

The Venezuelan direct taxes is mainly composed of taxes on income and wealth. To measure the impact of petroleum exports on direct taxes, a regression equation was performed with the following results:

Direct Taxes = -0.23 + 0.61 (Petroleum Exports)

R^2 = 0.88067 F = 147.59 DW = 0.75

The above regression equation indicates that there is a positive relationship between petroleum exports and direct taxes.

The indirect taxes is mainly composed of petroleum royalties, custom duties, i.e., import and transit duties; stamp duties and excises. The impact of petroleum exports on indirect taxes in Venezuela was measured by the following equation:

Indirect Taxes = 0.02 + 0.38 (Petroleum Export)

R^2 = 0.83217 F = 99.16 DW = 1.12

There is a positive relationship between the endogenous and the exogenous variable. The value of the regression coefficient indicates a small impact of an increase of 0.38 bolivare in indirect taxes if petroleum exports increased by one Venezuelan bolivare. The coefficient of determination is 0.83 which indicates that the fit of the regression line to the points of the endogenous variable is close. The F test indicates that the equation is statistically significant.

The Effects of Petroleum Exports on Budget Expenditures

The contribution of petroleum exports on defense, education and social services including health were measured by a regression test which indicated the following results:

Defense = -0.02 + 0.10 (Petroleum Exports)

R^2 = 0.90652 F = 193.95 DW = 1.27

Education = -0.07 + 0.19 (Petroleum Exports)

R^2 = 0.81509 F = 88.16 DW = 0.61

Social Services Including Health = -0.11 + 0.30 (Petroleum Exports)

R^2 = .90670 F = 145.77 DW = 1.12

The above equations indicate that there is a positive relationship between the endogenous variables and the exogenous variable. The impact of the exogenous variable on defense, education, and social services is small as indicated from the value of the regression coefficient.

Summary

The results of the regression model computed for the Venezuelan economy showed that the correlation coefficient was positive indicating a direct relationship between the exogenous variable, petroleum export, and the endogenous variables. The regression analysis indicated that there is a small impact of the petroleum exports on non-petroleum exports, indirect taxes, defense, education and social services.

CHAPTER VI

THE INDIRECT IMPACT OF THE SPECIFIED EXPORTS ON THE ECONOMIES OF BRAZIL, CHILE, MEXICO, AND VENEZUELA

The purpose of this chapter is to determine the contribution of the exogenous variable, that is the iron, copper, lead, and the petroleum exports on specific economic sectors of the Brazilian, Chilean, Mexican, and Venezuelan economy respectively when another exogenous variable is introduced. The hypothesis to be tested is that there is no positive impact of iron, copper, lead and petroleum exports on the Brazilian, Chilean, Mexican, and Venezuelan economy when a second exogenous variable is introduced. A second hypothesis also tested is that there is no significant unique contribution of iron, copper, lead, and petroleum exports on the prediction of the macroeconomic variables in Brazil, Chile, Mexico, and Venezuela when a second exogenous variable is introduced. To test for the presence of auto-correlation between the

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[1]J. Johnston, Econometric Methods (New York: McGraw-Hill Book Company, 1972), pp. 129-131.

endogenous and the exogenous variables, Durbin Watson statistics were used

This is a demand oriented model, but also includes an aggregate production function. The aggregate production function was estimated as a function of total investment with a one year lag.[2] Unless otherwise indicated, the equations of the indirect model are:

1. Private Consumption = $a + b_1$ Disposable Income + b_2X
2. Government Consumption = $a + b_1$ Total Taxes + b_2X
3. Investment = $a + b_1$ $Income_{t-1}$ + b_2X
4. Total Imports = $a + b_1$ Income + b_2X
5. Exports of Non Mineral = $a + b_1$ $V_{n\text{-}export}$ + b_2X
6. Direct Taxes = $a + b_1$ Income + b_2X
7. Indirect Taxes = $a + b_1$ Total Imports + b_2X
8. Defense = $a + b_1$ Population + b_2X
9. Education = $a + b_1$ Population + b_2X
10. Social Services including Health = $a + b_1$ Population + b_2X
11. $V_{n\text{-}export} = a + b_1$ $Investment_{t-1}$ + b_2X

Identity Equations:

1. Disposable Income = GNP - Total Taxes
2. $V_{n\text{-}export}$ = GNP + Net Factor Payments Abroad (both equal to gross domestic product) less metal or petroleum export.

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[2]United Nations Economic and Social Office in Beirut, Studies on Selected Development Problems in Various Countries in the Middle East (N.Y.: United Nations Publication, 1968), p. 3, 4.

3. GNP = C_p + C_g + I + Total Exports - Total Imports
- Net Factor Payments Abroad

4. Exports of Non-Mineral = Total Exports - X

Iron, copper, lead, petroleum exports and a second exogenous variable were regressed on the endogenous variable to estimate the contribution of the specified exports on the various economic variables. The selection of the second variable was limited to the availability of data for each country. Private consumption was based on the Keynesian theory of income determination. The simple Keynesian hypothesis that consumption is a function of current disposable income was used. As for government consumption, it was treated as a function of total taxes, direct taxes plus indirect taxes.[3] Investment was estimated as a function of income with a one year lag. This function indicates that the higher the level of gross national product the higher the incentive to invest due to the higher level of aggregate demand. Total imports were estimated as a function of income except for the Chilean and Venezuelan models. The exports of the non-metal or petroleum sector was estimated as a function of the value of the non-metal or petroleum sector except for the exports of non-copper which was estimated as a function of gross national product. The direct taxes were estimated as a function of gross national product except for Chile. Indirect taxes were

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[3]E. Thorbecke and A. Condos, "Macroeconomic Growth and Development Models of the Peruvian Economy," in the Theory and Design of Economic Development, Adelman and Thorbecke, eds. (Baltimore: John Hopkins University Press, 1970), pp. 181-209.

estimated as a function of total imports. This function maintained that as the value of total imports increase the more indirect taxes that will be collected. Defense expenditures were estimated as a function of population except in the Mexican and Venezuelan models. Education expenditures were estimated as a function of population except for the Brazilian and Venezuelan models. Expenditures on social services were estimated as a function of population except for the Brazilian model. The value of the non-iron export, non-lead export and non-petroleum export was estimated as a function of investment with a one year lag.[4] The results of the multiple regression analysis for the four countries in this study is presented in the following sections followed by the F test for the analysis of significance of the specified exports on the macroeconomic variables when another exogenous variable is introduced in the equations.

Brazil

A multiple regression analysis to show the impact of the iron export and a second exogenous variable on the selected economic variables was performed for the period 1950-1971.[5]

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[4]United Nations, Economic and Social Office in Beirut, Studies on Selected Development Problems in Various Countries in the Middle East, op. cit.

[5]The degrees of freedom for the regression equations computed for the period 1950-1971 are 2,19. The critical F value is 3.52 for the 95% significance level. Data for education and health was available for the period 1960-1971 only. Thus, the degrees of freedom for the regression equations computed are 2,9 and the F critical value is 4.26 for the 95%

Estimation of the Consumption Function

The regression equation for private consumption was estimated as follows:

$$C_p = 44.45 + 0.84\ Y_d - 22.25\ X_{iron}$$

$$R^2 = 0.99914 \quad F = 10984.26 \quad DW = 1.39$$

The regression coefficient of disposable income is positive whereas the regression coefficient of iron exports is negative. The coefficient of determination is very high and indicates a 99.9% reduction in the total sum of squares. The F test proved to be significant.

To measure the impact of iron exports and total taxes on government consumption, a regression test was performed with the following results:

$$C_g = 39.85 + 0.95\ T_t + 2.79\ X_{iron}$$

$$R^2 = 0.99157 \quad F = 1117.18 \quad DW = 0.84$$

The regression coefficients are positive and statistically significant. The coefficient of determination was found to be very high and indicates a 99.1% reduction in the total sum of squares. The positive impact of iron exports seems to be large as indicated from the value of the regression coefficient.

Estimation of the Investment Function

The regression equation for investment in Brazil was estimated from iron exports and income. The estimated regression equation showed the following results:

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significance level. The critical values for the Durbin Watson statistic for two exogenous variables, 22 observations, and the 99% significance level is 0.91-1.28.

$$I = -51.35 + 0.05Y + 39.19X_{iron}$$

$$R^2 = 0.98994 \quad F = 934.86 \quad DW = 1.46$$

The regression coefficients are positive and indicate that an increase of one cruizero in income will increase investment by only 0.05 cruizero. An increase in one cruizero in iron exports will increase investment by almost 40 cruizeros. The coefficient of determination was found to be high and the F test highly significant.

Estimation of Total Imports and Exports of Non Iron

Total imports was estimated as a function of income and iron exports. The regression test showed the following results:

$$\text{Total Imports} = -2.79 + 0.09Y - 2.80X_{iron}$$

$$R^2 = 0.99744 \quad F = 3697.25 \quad DW = 2.71$$

The coefficient of determination is high indicating a 99.7% reduction in the total sum of squares. The F test is highly significant. There seems to be a negative relationship between the iron exports and total imports which might indicate that the earnings from the iron exports is used for a cause other than purchasing imported products. There is a positive but small impact of income on the Brazilian imports.

Total exports including the Brazilian iron export sector were estimated as a function of iron exports and the value of non iron exports. The estimated regression equation was as follows:

$$\text{Exports of Non Iron} = 6.93 + 0.03\ V_{\text{n-iron}} + 4.26\ X_{\text{iron}}$$

$$R^2 = 0.99639 \qquad F = 2624.57 \qquad DW = 1.96$$

The coefficient of determination was found to be very high indicating a 99.6% reduction in the total sum of squares. The value of the regression coefficient indicates that an increase of one cruizero in the value of non iron exports will lead to an increase of 0.03 cruizero only in the total exports including iron. However, an increase of one cruizero in the iron exports will lead to an increase of approximately 4.3 cruizeros.

Estimation of Taxes

Direct taxes in Brazil were estimated as a function of gross national product and the iron export sector. The following regression equation was estimated by regression iron exports and gross national product on direct taxes.

$$T_d = 2.99 + 0.01\ Y + 2.67\ X_{\text{iron}}$$

$$R^2 = 0.99409 \qquad F = 1599.24 \qquad DW = 2.13$$

The coefficient of determination indicates a 99.4% reduction in the total sum of squares. The regression coefficients are positive and their values indicate that an increase of one cruizero in income will lead to a 0.01 increase only in direct tax, whereas an increase of one cruizero in iron exports will lead to an increase of approximately 2.7 cruizeros in direct tax. The F test proved to be significant.

Indirect taxes were estimated by regressing total imports and iron exports. The estimated regression equation

had the following results:

$$T_i = -2.36 + 0.96\ M - 0.66\ X$$

$$R^2 = 0.99088 \quad F = 1032.05 \quad DW = 1.56$$

The coefficient of determination is high indicating a 99% reduction in the total sum of squares. The F value is significant. The partial regression coefficient of imports is positive, whereas, the partial regression coefficient of iron exports is negative.

Estimation of the Endogenous Variables of Budget Expenditure

Defense expenditures were estimated as a function of the Brazilian population and iron exports. The estimated regression equation had the following results:

$$\text{Defense} = -72.62 + 0.001\ \text{Population} + 4.62\ X_{iron}$$

$$R^2 = 0.96905 \quad F = 297.48 \quad DW = 1.82$$

There is a positive relationship between the endogenous variable and the exogenous variables. The impact of iron exports on defense seems to be larger than the impact of population on defense expenditures. The coefficient of determination is high and the F test is highly significant.

Expenditures on education were estimated as a function of income and iron exports. The estimated regression equation indicated the following results:

$$\text{Education} = 16.82 + 0.01\ Y - 1.35\ X_{iron}$$

$$R^2 = 0.96510 \quad F = 124.44 \quad DW = 0.37$$

The coefficient of determination indicates a 95.5% reduction

in the total sum of squares and a highly statistically significant F test. There seems to be an inverse relationship between iron exports and education expenditures.

Health expenditures in Brazil were estimated as a function of income and iron exports and the estimated function had the following results:

$$\text{Health} = 6.75 + 0.01\ Y - 1.57\ X_{iron}$$

$$R^2 = 0.89474 \qquad F = 38.25 \qquad DW = 0.61$$

There is also an inverse relationship between iron exports and health. The R^2 indicates a 89% reduction in the total sum of squares and the F test is statistically significant.

Estimation of the Production Function of the Non Iron Sector

The writer assumes that the national economy of Brazil, the gross domestic product, was divided into the iron sector and the non-iron sector. The growth of the iron sector depends upon the investment policies of the iron producing companies. The growth of the non-iron sector depends on government investment policies. The growth of the non-iron sector, thus, depends on total investment. The value of the non-iron sector was estimated as a function of total investment with a one year lag[6] and the iron exports. The estimated regression equation indicated the

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[6]United Nations, Economic and Social Office in Beirut, Studies on Selected Development Problems in Various Countries in the Middle East, op. cit. The same assumption is made for Chile, Mexico, and Venezuela.

following results:

$$V_{n\text{-}iron} = 154.10 = 0.53\ I_{t-1} + 192.40\ X_{iron}$$
$$R^2 = 0.99489 \quad F = 1848.97 \quad DW = 1.15$$

The coefficient of determination indicates a close fit of the regression line to the observations of the endogenous variable. The partial regression coefficients are positive and indicate that there is a very large impact of iron exports on the value of the non-iron sector. The F test is highly significant.

Chile

A multiple regression analysis to show the impact of the copper export in Chile, in addition to a second exogenous variable on the selected endogenous variables was performed for the period 1950-1970.[7]

Estimation of the Consumption Function

The following estimated regression equation was the result of regressing copper exports and disposable income on private consumption:

$$C_p = 16.81 + 0.77\ Y_d + 0.16\ X_{copper}$$
$$R^2 = 0.99980 \quad F = 44132.52 \quad DW = 0.71$$

The regression coefficients are positive and statistically significant. The impact of copper exports and disposable

[7]The degrees of freedom for the regression equations computed for Chile for the period 1950-1970 are 2,18. The critical value is 3.55 for the 95% significance level. The critical values for the Durbin Watson statistic for two exogenous variables, 21 observations, and the 99% significance level is 0.89-1.27.

income is small as indicated from the value of the partial regression coefficients. The coefficient of determination is very high indicating a 99.98% reduction in the total sum of squares.

Government consumption was estimated as a function of total taxes and copper exports. The estimated multiple regression equation showed the following results:

$$C_g = 2.96 + 1.03\ T_t - 0.57\ X_{copper}$$

$$R^2 = 0.99907 \qquad F = 9635.18 \qquad DW = 1.06$$

The coefficient of determination indicates a 99.9% reduction of the total sum of squares. The F value is statistically significant. The sign of the partial regression coefficient of total taxes is positive, but the sign of the partial regression coefficient of copper exports is negative indicating an inverse relationship between copper exports and government consumption.

Estimation of the Investment Function

The estimated multiple regression equation for total investments in Chile as a function of income and the copper export sector indicated the following:

$$I = 5.44 + 0.10\ Y + 0.08\ X_{copper}$$

$$R^2 = 0.99582 \qquad F = 2025.27 \qquad DW = 0.13$$

Due to the low Durbin Watson, a test estimating investments as a function of per capita income and copper exports, and a test estimating investments as a function of population and copper exports was performed with the following results:

$$I = -15.23 + 0.09\ Y_{\text{per capita}} + 0.20\ X_{\text{copper}}$$

$R^2 = 0.99784$ F = 3928.31 DW = 0.12

$$I = -96.98 + 0.015\ \text{Population} + 1.09\ X_{\text{copper}}$$

$R^2 = 0.97878$ F = 415.18 DW = 2.43

Investment taken as a function of per capita income was not included in the Chilean model because of the low Durbin Watson. Investment taken as a function of population in Chile was included in the model. A positive relationship is indicated between investments, population, and copper exports. The coefficient of determination is high and the F test is statistically significant.

Estimation of Imports and Exports of Non Copper

The impact of copper exports on total imports in Chile was estimated by a multiple regression analysis. Total imports was considered a function of income and copper exports. The multiple regression test indicated the following results:

$$\text{Total Imports} = -14.97 + 0.12\ Y - 0.13\ X_{\text{copper}}$$

$R^2 = 0.99682$ F = 2662.68 DW = 0.11

Due to the very low Durbin Watson statistic, total imports were estimated as a function of population and the results of this regression equation were used in the Chilean model:

$$\text{Total Imports} = 31.89 - 0.003\ \text{Population} + 1.13\ X_{\text{copper}}$$

$R^2 = 0.97122$ F = 303.69 DW = 2.33

A multiple regression test was performed to show the impact of copper exports on total exports excluding copper with the presence of a second exogenous variable. Total

exports excluding copper was taken as a function of the value of the non-copper export sector and copper exports. The regression test showed the following results:

$$X_{n\text{-}copper} = -9.30 + 0.13\ V_{n\text{-}copper} - 0.61\ X_{copper}$$
$$R^2 = 0.95622 \quad F = 196.59 \quad DW = 0.75$$

The coefficient of determination indicates a 96.3% reduction in the total sum of squares and the F value is statistically significant. The value of the partial regression coefficients is small for both the exogenous variables. There is an inverse relationship between total exports excluding copper and copper exports.

Estimation of Taxes

Direct taxes was considered as a function of income and copper exports. The estimated multiple regression test indicated the following:

$$T_d = -7.77 + 0.05\ Y + 0.15\ X_{copper}$$
$$R^2 = 0.99109 \quad F = 945.86 \quad DW = 0.17$$

Due to the low Durbin Watson a test estimating direct taxes from per capita income and copper exports, and a test estimating direct taxes from population and copper exports indicated the following results:

$$T_d = -11.86 + 0.04\ Y_{per\ capita} + 0.22\ X_{copper}$$
$$R^2 = 0.99184 \quad F = 1032.53 \quad DW = 0.16$$

$$T_d = 3.00 - 0.0003\ Population + 0.62\ X_{copper}$$
$$R^2 = 0.97930 \quad F = 425.80 \quad DW = 2.33$$

Direct taxes taken as a function of per capita income was not included in the Chilean model due to the low Durbin Watson statistic. Direct taxes taken as a function of population and copper exports was included in the Chilean model. The coefficient of determination is high, and the F test is highly significant. There seems to be a positive relationship between copper exports and direct taxes.

Indirect taxes was considered as a function of total imports and the exports of copper. A multiple regression test was performed and showed the following results:

$$T_i = -3.56 + 0.53\ M + 0.28\ X_{copper}$$

$$R^2 = 0.99948 \quad F = 17398.40 \quad DW = 1.89$$

The coefficient of determination indicates almost a perfect fit of the estimated observation to the actual data. The F value is statistically significant and the regression coefficients are both positive but the impact of copper exports on indirect tax seems to be small.

Estimation of the Endogenous Variables of Budget Expenditure

Defense, education, and social services including health were estimated as a function of population and copper exports. The regression tests indicated the following results:

$$\text{Defense} = 22.79 - 0.003\ \text{Population} + 0.18\ X_{copper}$$

$$R^2 = 0.94705 \quad F = 160.98 \quad DW = 2.16$$

$$\text{Education} = 31.77 - 0.005\ \text{Population} + 0.32\ X_{copper}$$

$R^2 = 0.97524 \quad F = 354.54 \quad DW = 2.50$

Social Services = -15.15 + 0.002 Population + 0.13 X_{copper}

$R^2 = 0.96217 \quad F = 228.91 \quad DW = 2.35$

There is a positive relationship between defense and social services including health and copper exports although the impact seems to be small. There is an inverse relationship between defense and education, and the exogenous variable population. The coefficient of determination for the estimated functions are high and the F tests are statistically significant.

Estimation of the Production Function of the Non-Copper Sector

The gross domestic product of Chile was assumed to be divided into the copper sector and the non-copper sector. The growth of the non-iron sector depends on total investment, thus, the value of the non-iron sector was estimated as a function of copper exports and total investment with a one year lag. The estimated multiple regression test indicated the following results:

$V_{n\text{-}copper} = 66.30 + 5.50\ I_{t-1} + 0.21\ X_{copper}$

$R^2 = 0.99884 \quad F = 7758.06 \quad DW = 1.17$

The partial regression coefficients are positive. An increase of one Chilean escudo in investment will lead to an increase of 5.5 escudos in the value of non-copper export sector. An increase of one Chilean escudo in copper export will lead to an increase of only 0.21 escudo in the value of

non-copper sector. The coefficient of determination indicates a 99.9% reduction in the total sum of squares, and the F test is statistically significant.

Mexico

The impact of lead exports and a second exogenous variable on the endogenous variables was shown by a multiple regression analysis for the period 1952-1970.[8]

Estimation of the Consumption Function

A multiple regression test was performed to estimate both private and government consumption. The estimated regression equation as a result of regressing lead exports and disposable income on private consumption showed the following results:

$$C_p = 2.33 + 0.74\ Y_d - 24.31\ X_{lead}$$

$$R^2 = 0.99784 \qquad F = 3703.14 \qquad DW = 1.48$$

The coefficient of determination is very high indicating that approximately 99.8% of the variation of the actual values of the endogenous variable are accounted for or explained by the regression equation. The F value of the regression equation is statistically significant. The marginal propensity to consume is estimated at .74 from the above regression equation.

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[8]The critical F value of 3.55 is statistically significant for 95% significance level and 2,18 degrees of freedom. The critical values for the Durbin Watson statistic for two exogenous variables and 21 observations for the 99% significance level is 0.83-1.26.

Government consumption was considered a function of total taxes and lead exports. The estimated multiple regression indicated the following results:

$$C_g = -6.76 + 5.58\ T_t + 51.09\ X_{lead}$$

$$R^2 = 0.24793 \quad F = 2.64 \quad DW = 2.47$$

The coefficient of determination is low indicating that there is approximately 24.8% reduction in the total sum of squares, thus, the amount of improvement in terms of reducing the total error brought about by fitting the regression line is small. The F test of the regression equation is not statistically significant.

Estimation of the Investment Function

Investment in Mexico was considered as a function of income and lead exports. The result of the estimated regression equation was:

$$I = -22.23 + 0.99\ Y + 227.17\ X_{lead}$$

$$R^2 = 0.28085 \quad F = 3.12 \quad DW = 2.63$$

The results indicate a low coefficient of determination of .28 and an F value of 3.12 which is not statistically significant. The low R^2 implies that there was only a 28% reduction in the total sum of squares. The signs of the regression coefficients are positive indicating that an increase in investments of .99 Mexican peso and 227 Mexican pesos is the result of a one peso increase in disposable income and lead exports, respectively. Thus, from the above regression the marginal propensity to invest is .99.

Estimation of Imports and Exports of Non-Lead

Total imports in Mexico was estimated as a function of income and copper exports. The results of the estimated multiple regression test was:

$$\text{Total Imports} = -10.26 + 0.48\ Y + 114.87\ X_{lead}$$

$$R^2 = 0.26573 \quad F = 2.89 \quad DW = 2.65$$

The coefficient of determination is low indicating a 26% reduction in the total sum of squares and the F test is not statistically significant. There appears to be a large positive impact of lead exports on the Mexican imports.

To show the impact of the lead export on total exports excluding lead with the presence of a second exogenous variable, the non-lead export sector was estimated as a function of the value of the non-lead export sector and lead exports. The estimated regression test had the following results:

$$X_{n\text{-}lead} = 0.26 + 0.07\ V_{n\text{-}lead} + 6.91\ X_{lead}$$

$$R^2 = 0.95281 \quad F = 161.51 \quad DW = 0.99$$

The coefficient of determination is high and indicates approximately a 95.3% reduction in the total sum of squares that is 95% of the variation in the endogenous variable is explained by the regression equation. The values of the F test indicates that it is statistically significant. There is a positive relationship between the exogenous variables and the endogenous variable. However, a one peso increase in lead exports will lead to a greater increase in the

endogenous variable than the second exogenous variable, the value of non-lead exports.

Estimation of Taxes

The Mexican taxes are basically divided into direct tax and indirect tax. Direct tax was estimated as a function of gross national product and lead exports. By regressing the exogenous variables on the endogenous variable, direct tax, the estimated regression equation had the following results:

$$T_d = -0.21 + 0.03\ Y + 1.71\ X_{lead}$$

$$R^2 = 0.99025 \quad F = 812.49 \quad DW = 1.32$$

The coefficient of determination indicates that 99% of the variation in the dependent variable is explained by the regression equation. The F test is statistically significant and the signs of the regression coefficients indicate a positive relationship between the exogenous variables and the endogenous variable.

Indirect taxes were estimated as a function of total imports and lead exports. A multiple regression test was performed and indicated the following results:

$$T_i = 1.36 + 0.01\ M - 14.81\ X_{lead}$$

$$R^2 = 0.63892 \quad F = 14.15 \quad DW = 1.66$$

The coefficient of determination seems to be lower than the R^2 for the estimated direct tax equation, but the F test indicates that the amount of variance explained is statistically significant.

Estimation of the Endogenous Variables of Budget Expenditure

Defense and education expenditure were estimated as a function of income and lead exports. The estimated regression equations had the following results:

$$\text{Defense} = -0.20 + 0.01\ Y + 2.85\ X_{lead}$$
$$R^2 = 1.00 \quad F = \infty \quad DW = 1.11$$

$$\text{Education} = -3.13 + 0.10\ Y - 0.07\ Y_{t-1} - 0.82\ X_{lead}$$
$$R^2 = 1.00 \quad F = \infty \quad DW = 0.86$$

In the above estimated regression equations 100% of the variation of the actual values of the endogenous variable are accounted for by the regression equation, thus the F test is equal to infinity. Estimating expenditures on social services, including health as a function of population indicated the following:

$$\text{Social Services} = -0.49 + 0.00002\ \text{Population} + .06\ X_{lead}$$
$$R^2 = .99125 \quad F = 905.81 \quad DW = 1.80$$

There is a positive relationship between lead exports and social services. The coefficient of determination is very high indicating a 99% reduction in the total sum of squares and the F test is statistically significant.

Estimation of the Production Function of the Non-Lead Sector

The value added of the non-lead sector was estimated as a function of lead exports and total investment with a one year lag. A regression test was performed to estimate the value of the non-lead sector. The regression test

indicated the following results:

$$V_{n\text{-}lead} = 41.79 + 0.18\ I_{t-1} - 540.87\ X_{lead}$$
$$R^2 = 0.71998 \quad F = 20.57 \quad DW = 1.20$$

The coefficient indicates approximately 72% reduction in the total sum of squares and the F test is statistically significant. There is a large inverse relationship between lead exports and the value of the non-lead sector in Mexico.

Venezuela

For the estimated equations, the sample consists of yearly observations for the period 1950-1971.[9] The impact of the exogenous variables and the endogenous variables was shown by estimating regression equations for the Venezuelan economy.

Estimation of the Consumption Function

A regression test was performed to estimate the private and government consumption functions. Private consumption was estimated as a function of disposable income and petroleum exports. The estimated regression for private

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[9]The degrees of freedom for the regression equations computed for the period 1950-1971 are 2,19. The critical F value which corresponds to 2,19 degrees of freedom at 95% level of significance is 3.52. Thus, the F value of the regression equation of 3.52 or above is considered statistically significant. The Durbin Watson statistic for two exogenous variables, 22 number of observations and the 99% significance level is 0.91-1.28. The data for the endogenous variable social services including health was available only for the period 1950-1954 and 1960-1971. The degrees of freedom in this case is 2,14. The critical F value is 3.74 for 99% significance level. The Durbin Watson statistic for two exogenous variables, 17 observations and the 99% significance level is 0.77-1.25.

consumption in Venezuela had the following results:

$$C_p = 0.02 + 0.67\ Y_d + 0.05\ X_{Petroleum}$$
$$R^2 = 0.99025 \quad F = 964.66 \quad DW = 1.73$$

The marginal propensity to consume is 0.67 in Venezuela for the period 1950-1971. The value of partial regression coefficient of petroleum exports indicate that as petroleum exports increases by one Venezuelan bolivare, private consumption increases by .05 bolivare only. The coefficient of determination is high indicating a 99% reduction in the total sum of squares. The F value for the regression equation is considered statistically significant.

Government consumption was estimated as a function of total taxes and petroleum exports. The estimated regression equation indicated the following results:

$$C_g = 0.01 + 0.91\ T_t - 0.19\ X_{Petroleum}$$
$$R^2 = 0.95883 \quad F = 221.28 \quad DW = 1.39$$

The coefficient of determination is high indicating a close fit of the values of the regression line to the actual observations. The F value for the regression line was found to be statistically significant. Petroleum exports has an inverse relationship with the endogenous variable, whereas, there is a positive relationship between total taxes and government consumption.

Estimation of the Investment Function

Investments was estimated as a function of income and petroleum exports in Venezuela. The estimated regression

equation for investments had the following results:

$$I = -0.003 + 0.19\ Y + 0.12\ X_{petroleum}$$

$$R^2 = 0.91968 \quad F = 108.78 \quad DW = .86$$

There is a positive relationship between the exogenous variables and investments in Venezuela. There seems to be a small impact on investment from income and petroleum exports as indicated from the value of the partial regression coefficients. The coefficient of determination is high and the F test of the regression line is statistically significant.

Estimation of Total Imports and Exports of Non-Petroleum Sector

The estimated multiple regression equation for total imports had the following results:

$$\text{Total Imports} = 0.46 - 0.0001\ \text{Population} + 0.21\ Y + 0.57\ X_{Petroleum}$$

$$R^2 = 0.99236 \quad F = 779.32 \quad DW = 0.91$$

Petroleum exports is positively related to total imports but has a moderate impact as indicated from the value of the regression coefficient. The R^2 is very high and the F test is statistically significant.

Total exports excluding petroleum export were estimated as a function of petroleum exports and the value of non-petrcleum exports. The estimated multiple regression equation had the following results:

$$\text{Exports of Non-Petroleum} = 0.03 + 0.09\ V_{n\text{-petroleum}} - 0.14\ X_{Petroleum}$$

$R^2 = 0.74188$ $F = 27.30$ $DW = .93$

There is an inverse relationship between the endogenous variable and petroleum exports, but a positive relationship between the endogenous variable and the value of non-petroleum exports. The coefficient of determination indicates a 74% reduction in the total sum of squares, and the F test for the regression line is statistically significant.

Estimation of Taxes

Taxes were divided into direct and indirect taxes. Direct taxes were estimated as a function of income and petroleum exports in Venezuela. The estimated multiple regression equation for direct taxes indicated the following results:

$$T_d = -0.11 + 0.15\ Y - 0.04\ X_{Petroleum}$$

$R^2 = 0.95527$ $F = 202.88$ $DW = 1.15$

The coefficient of determination indicates a 95.5% reduction in the total sum of squares and the F test for the regression line is statistically significant. There seems to be an inverse relationship between the endogenous variable and petroleum exports, but a positive relationship between the direct taxes and gross national product.

By regressing total imports and petroleum exports on indirect taxes, the following estimated multiple regression equation is indicated:

$$T_i = 0.02 + 0.02\ M + 0.36\ X_{Petroleum}$$

$R^2 = 0.83247$ $F = 47.2$ $DW = 1.1$

There is a positive relationship between the endogenous variable, indirect tax, and the exogenous variables. However, there seems to be a small impact from total imports and petroleum exports on indirect tax as indicated from the value of the partial regression coefficients. The coefficient of determination indicates that 83% of the variation of the actual values of the dependent variable are explained by the regression equation. The F test of the regression line is statistically significant.

Estimation of the Endogenous Variables of Budget Expenditure

Defense expenditures were estimated as a function of population and petroleum exports. The regression test indicated:

$$\text{Defense} = 408.89 - 0.25\ \text{Population} + 0.51\ X_{\text{Petroleum}}$$

$$R^2 = 0.0829 \quad F = 1.04 \quad DW = .1632$$

Another regression test estimating defense expenditures from income and petroleum exports which will be used in the Venezuelan model resulted in:

$$\text{Defense} = -0.004 + 0.02\ Y + 0.01\ X_{\text{Petroleum}}$$

$$R^2 = .96110 \quad F = 234.71 \quad DW = 1.03$$

The impact of petroleum exports or defense expenditures is small but positive. The coefficient of determination is high and the F test is statistically significant.

Education expenditures estimated as a function of the Venezuelan population and the petroleum exports resulted in:

$$\text{Education} = 860.4 - 0.17\ \text{Population} + 0.16\ X_{\text{Petroleum}}$$

$$R^2 = 0.1387 \qquad F = 1.85 \qquad DW = 0.24$$

Thus, estimating education expenditures from income and petroleum exports, the regression equation showed the following:

$$\text{Education} = -0.02 + 0.06\ Y - 0.09\ X_{\text{Petroleum}}$$

$$R^2 = .95213 \qquad F = 188.96 \qquad DW = 1.13$$

The coefficient of determination is high indicating a 95% reduction in the total sum of squares and the F test is highly significant. But, there seems to be an inverse relationship between petroleum exports and education expenditures.

Social services including health expenditures were estimated as a function of health and petroleum exports. The estimated regression equation indicated the following results:

$$\text{Social Services} = -0.14 + 0.00001\ \text{Population} + 0.23\ X_{\text{Petroleum}}$$

$$R^2 = 0.92883 \qquad F = 91.35 \qquad DW = .91$$

The coefficient of determination indicates a 93% variation of the actual observations accounted for by the regression line and a statistically significant F test. A positive relationship exists between petroleum exports and social services.

Estimation of the Production Function of the Non-Petroleum Sector

The gross domestic product of Venezuela was assumed to be divided into the petroleum sector and the non-petroleum

sector. The growth of the non-petroleum sector depends on total investment, thus, the value of the non-petroleum sector was estimated as a function of petroleum exports and total investment with a one year lag. A multiple regression test was performed and indicated the following results:

$$V_{n\text{-petroleum}} = 0.55 + 1.64\ I_{t-1} + 2.15\ X_{petroleum}$$
$$R^2 = 0.93228 \quad F = 130.78 \quad DW = 1.33$$

There seems to be a positive relationship between the endogenous variable and the exogenous variables. The coefficient of determination indicates a 93% reduction in the total sum of squares and the F test of the regression line is statistically significant.

This section is concerned with the unique contribution of iron, copper, lead, and petroleum exports in the presence of the selected exogenous variable in the prediction of the endogenous variables. A test of unique contribution to predictability is a test that the semi-partial correlations between the specified exports and the endogenous variables are zero. The test statistic for the semi-partial correlation, (SPC), is again a F ratio which is calculated as:

$$F = \frac{R^2_{y\cdot x_1,x_2} - R^2_{y\cdot x_1}}{(1-R^2_{y\cdot x_1,x_2})/n-3},$$

where x_2 represents the specified export for the selected countries and x_1 represents a second exogenous variable

for predicting y, the endogenous variable. If the calculated F value for the exports is greater than the critical F value, the unique contribution of the exports is statistically significant. For Brazil, the critical F for tests of the SPC's is 4.38 for 1,19 degrees of freedom (95%) significance level) for the regression equations computed.

Data for education and health was available for the period 1960-71, thus, the critical F for tests of the SPC's is 5.12 for 1,9 degrees of freedom and 95% significance level for the regression equations computed.

Table 6-1 indicates the SPC's and the associated F's for the unique effect of iron exports in Brazil. Iron exports has a significant unique effect on government consumption investment, exports of non-iron, defense, health and the value of non-iron in the presence of other exogenous variables.

The critical F value for Chile is 4.41 for 1,18 degrees of freedom for the regression equations computed and a 5% probability level. If the calculated F for the regression equations computed is greater than 4.41, the hypothesis that copper exports has no unique effect on the prediction of the macroeconomic endogenous variables in the presence of a second exogenous variable is rejected. From Table 6-2 the hypothesis that copper exports does not have a significant unique effect on government consumption, investments, imports, non-copper exports, direct tax,

TABLE 6-1

SEMI-PARTIAL CORRELATIONS[2] AND ASSOCIATED F'S FOR THE UNIQUE EFFECTS OF IRON EXPORTS IN BRAZIL
n = 22

Endogenous Variable	Square Semi-Partial Correlation	F	Secon-Exogenous Variable
1. Private Consumption	0.00011	2.43	Y_d
2. Government Consumption	0.01121	25.26*	T_t
3. Investment	0.00303	5.72*	Y
4. Imports	0.00015	1.11	Y
5. Non Iron Exports	0.00185	9.74*	$V_{n\text{-}iron}$
6. Direct Tax	0.00129	4.15	Y
7. Indirect Tax	0.00002	0.42	M
8. Defense	0.31705	194.66*	Pop.
9. Education	0.00487	1.26	Y
10. Health	0.08908	7.62*	Y
11. $V_{n\text{-}iron}$	0.00811	30.15*	I_{t-1}

*F is significant at or beyond the 95% level.

indirect tax, defense, education, and social services is rejected.

For Mexico, the critical F value for a 95% significance level and 1,16 degrees of freedom for the SPC's computed is 4.49. Table 6-3 indicates that the hypothesis that lead exports do not have a significant unique effect on the selected endogenous variables in the presence of a second exogenous variable is rejected for private consumption, non-lead exports, indirect tax, and the value of non-lead exports.

TABLE 6-2

SEMI-PARTIAL CORRELATIONS[2] AND ASSOCIATED F'S FOR THE UNIQUE EFFECTS OF COPPER EXPORTS IN CHILE
n = 21

Endogenous Variable	Square Semi-Partial Correlation	F	Second Exogenous Variable
1. Private Consumption	0.00002	1.75	Y_d
2. Government Consumption	0.95957	18572.32*	T_t
3. Investment	0.42898	1847.28*	Pop.
4. Imports	0.46343	2623.19*	Pop.
5. Non-Copper Exports	0.69422	285.43*	$V_{n\text{-copper}}$
6. Direct Tax	0.46160	401.4*	Pop.
7. Indirect Tax	0.00299	101.67*	M
8. Defense	0.48237	163.98*	Pop.
9. Education	0.49329	358.66*	Pop.
10. Social Services	0.41121	195.66*	Pop.
11. Value of Non-Copper	0.00002	0.36	I_{t-1}

*F is significant at or beyond the 95% level.

TABLE 6-3

SEMI-PARTIAL CORRELATIONS[2] AND ASSOCIATED F'S FOR THE UNIQUE EFFECTS OF LEAD EXPORTS IN MEXICO
n = 19

Endogenous Variable	Square Semi-Partial Correlation	F	Second Exogenous Variable
1. Private Consumption	0.00065	5.32*	Y_d
2. Government Consumption	0.11656	2.79	T_t
3. Investment	0.01527	0.34	Y
4. Imports	0.01638	0.36	Y
5. Non-Lead Exports	0.55262	210.79*	$V_{n\text{-lead}}$
6. Direct Tax	0.00160	2.95	Y
7. Indirect Tax	0.46611	23.24*	M
8. Defense	0.00000	0.0	Y
9. Education	0.00000	0.0	Y_{t-1}
10. Social Services	0.00002	1.04	Pop.
11. Value of Non-Lead	0.45924	29.52*	I_{t-1}

*F is significant at or beyond the 95% level.

For Venezuela the critical F value for a 5% probability level and 1,19 degrees of freedom for the SPC's computed is 4.38. From Table 6-4 the unique effect of petroleum exports on the prediction of the endogenous macroeconomic variables in the presence of a second exogenous variable is statistically significant on government consumption, non petroleum exports, indirect tax, education, and the value of non-petroleum sector. Data for social services including health was available for the periods 1950-1954 and 1960-1971. Thus, the critical F value for 1,14 degrees

TABLE 6-4

SEMI-PARTIAL CORRELATION^2 AND ASSOCIATED F'S FOR THE UNIQUE EFFECTS OF PETROLEUM EXPORTS IN VENEZUELA
n = 22

Endogenous Variable	Square Semi-Partial Correlation	F	Second Exogenous Variable
1. Private Consumption	0.00003	0.05	Y_d
2. Government Consumption	0.88070	406.44*	T_t
3. Investment	0.00094	0.22	Y
4. Imports	0.00094	2.34	Pop., Y
5. Non-Petroleum Exports	0.58069	42.74*	$V_{n\text{-petroleum}}$
6. Direct Tax	0.00029	0.12	Y
7. Indirect Tax	0.09264	10.51*	M
8. Defense	0.00061	0.30	Y
9. Education	0.01438	5.71*	Y
10. Social Services	0.33299	65.50*	Pop.
11. Value of Non-Petroleum	0.03878	10.88*	I_{t-1}

*F is significant at or beyond the 95% level.

of freedom for the SPC's computed and 5% probability level is 4.60. Table 6-4 indicates that the unique effect of petroleum exports is statistically significant in the estimation of social services also.

Summary

The results of the multiple regression analysis for the unique contribution of the selected exports indicates a common factor for all the four Latin American countries. The analysis indicates that the selected exports have a unique significant contribution on the prediction of the endogenous variable, the non-mineral export sector. In addition, the selected export for each country has a unique effect on the prediction of various endogenous variables. In Brazil, the iron export has a unique contribution on the prediction of government consumption, investment, defense, health, and the value of the non-iron sector. The copper export in Chile has a unique contribution on the prediction of government consumption, investment, imports, direct tax, indirect tax, defense, education, and social services. The lead export in Mexico has a unique effect on the prediction of private consumption, indirect tax, and the value of the non-lead sector. In Venezuela, the petroleum export has a unique effect on the prediction of government consumption, indirect tax, education, social services, and the value of the non-petroleum sector.

CHAPTER VII

SUMMARY AND CONCLUSION

The main concern of this study has been the examination of the impact of iron, copper, lead, and petroleum exports on the economies of Brazil, Chile, Mexico, and Venezuela respectively. This examination was pursued by the use of both descriptive and statistical approaches. At the outset a brief review of the literature was presented in order to establish some perspective on the different views concerning the role of international trade in economic development.

This review suggests that there are two main schools of economic thought regarding the contribution of international trade, particularly based on primary products, to the economic development of the less developed countries. The first school basically composed of the classical economists, the staple theory economists, and the international trade theory economists believes that international trade has a positive effect on the less developed countries. The classical economists argue that international trade has a positive contribution because of the factors which play an essential role in the development of the nations. Some of these

factors are the stimulation of productivity, the possession of surplus of products above the domestic requirements, and the comparative gains from trade. The staple economists argue that the export of primary products has a direct contribution to the rest of the economy. As the demand for the staple export product increases, the quantity supplied also increases, thus, resulting in an increase in income. By spending this income, investment opportunities in the other sectors of the economy would be generated. The international trade economists, in general, believe that trade generates "spread effects," thus, promoting the growth of the rest of the economy.

It will be remembered that the second school of thought argues that not all types of potentially leading sectors are successful in spreading their expansion to the rest of the economy, at least in relation to peripheral countries with a primary type pattern of trade. These writers attribute the failure of the transmission mechanism in the case of primary export products to different causes. Among the most important reasons for the failure of transmission are the lack of strong "spread effects," the existence of domestic impediments, and the deterioration of the terms of trade. Some of the factors operating against "spread effects" are the creation of new wants and needs of the people, lack of investment incentives, and the general lack of industrial skills. Domestic impediments are usually

due to factor of production immobility and limited knowledge of the market. The deterioration of terms of trade is usually caused by the increasing gap between the prices of the primary products and the industrial products, the increase in demand for imports between the industrial and the peripheral countries, and the disparity between the productivity of primary products and manufactured products.

The presentation of the economic and historical background of the four countries revealed that a number of commonalities and differences characterize these countries. The foreign trade orientation of these countries was emphasized as well as the importance of iron, copper, lead, and petroleum exports to Brazil, Chile, Mexico, and Venezuela respectively.

The statistical review of the shares of iron, copper, lead, and petroleum exports as a per cent of total exports and of gross national product and the analysis of growth rates produced a number of interesting results. The average real growth rates of gross national product were 6.33%, 5.76%, 7.39% and 7.57% for Brazil, Chile, Mexico, and Venezuela. The average real growth rates of per capita income were 1.86%, 3.75%, 3.97%, and 3.51% for Brazil, Chile, Mexico, and Venezuela. The direction of the trend for the growth rates and the share of the specified exports indicated that the growth rates and the share of the specified exports in gross national product increased for Brazil

and Chile. The results also indicated a decreasing trend in both growth rates and the share of petroleum exports in the Venezuelan gross national product. However, the results for Mexico indicated an increasing trend in the growth rates but a decreasing trend in the share of lead exports in the gross national product. These findings support the results of the direct model.

The literature in the field of trade and development has expanded in an amazing fashion. Thus, the emergence of a number of hypotheses and their empirical testing has become an essential endeavor. It must be remembered that the main objective of this study was to examine the impact of the iron, copper, lead, and petroleum export sector on the Brazilian, Chilean, Mexican, and Venezuelan economies during the period 1950-1971. This was attained by testing the following hypotheses:

1. There is no positive direct impact of iron, copper, lead and petroleum exports on the Brazilian, Chilean, Mexican, and Venezuelan economy with regards to the variables previously mentioned, during the period 1950-1971.
2. There is no positive indirect impact of iron, copper, lead, and petroleum exports on the Brazilian, Chilean, Mexican, and Venezuelan economy with regards to the variables previously mentioned during the period 1950-1970.
3. There is no unique significant indirect impact of iron,

copper, lead and petroleum exports on the macroeconomic endogenous variables in the presence of a second exogenous variable in Brazil, Chile, Mexico, and Venezuela.

The results of the simple regression analysis indicated that there is a positive relationship between the endogenous variables and the exogenous variable in Brazil, Chile, and Venezuela. The results indicated that there is an inverse relationship between the endogenous macroeconomic variables and lead exports in Mexico. This was due to the decline in the production of lead exports while all the other endogenous variables increased during the period 1952-1970. Thus, the first hypothesis was rejected for Brazil, Chile, and Venezuela.

The relationship between the iron, copper, lead, and the petroleum export sector on the major macroeconomic variables for Brazil, Chile, Mexico, and Venezuela in the presence of other important exogenous variables were analyzed. The macroeconomic variables in Brazil which proved to be positively related to the iron export sector were government consumption, investment, exports of non-iron, direct tax, defense and the value of non-iron export sector. Thus, the second hypothesis was rejected for those variables in Brazil. The second hypothesis was rejected for the effect of copper exports on all the endogenous variables except government consumption in Chile. In Mexico, the second hypothesis was rejected when lead exports proved to

have a positive relationship to government consumption, investment, total exports, non-lead exports, direct tax, defense, and social services including health. Petroleum exports in Venezuela had a positive effect on private consumption, investment, total imports, indirect tax, defense, social services including health, and the value of non-petroleum export sector. Therefore, the second hypothesis was rejected for those macroeconomic variables.

To test for the unique contribution of the iron, copper, lead, and petroleum exports on the endogenous variables, the F test was performed for the indirect impact models. The iron export sector proved to be statistically significant on the prediction of the following macroeconomic variables: government consumption, investment, non-iron export, defense expenditures, health, and the value of non-iron export sector. Thus, the third hypothesis was rejected for those endogenous variables. In Chile, the effect of copper exports was statistically significant on the prediction of all the endogenous variables except for private consumption and the value of non-copper exports. Thus, the third hypothesis was rejected for the effect of copper exports on the prediction of all the endogenous variables except for the prediction of private consumption and the value of non-copper exports. The effect of lead exports, in Mexico, on the prediction of private consumption, non-lead exports, indirect tax, and the value of non-lead

export sector was statistically significant. Thus, the third hypothesis was rejected for those four variables. The third hypothesis was also rejected when the contribution of petroleum exports in Venezuela was found to be statistically significant on government consumption, non-petroleum export sector, indirect tax, education, social services including health and the value of non-petroleum export sector.

Finally, the statistical analysis showed that when the export in question was the only exogenous variable used to predict the macroeconomic variables in the direct model there was a positive relationship in all countries except Mexico. Thus, the classical theory that the primary commodities have a positive effect on the economy has been proven in the case of Brazil, Chile, and Venezuela. When other exogenous variables were used to predict the endogenous variables in addition to the iron, copper, lead, and petroleum export in the indirect model the effect and significance of the specified exports on the prediction of the endogenous variables seemed to diverge. However, the specified exports were statistically significant in the prediction of the non-iron export, non-copper export, non-lead export, and non-petroleum export in all four countries.

In the final analysis, this study represents a modest attempt to add to the stock of knowledge concerning the relationship of the export sector on the rest of the economy

with special reference to the four selected Latin American countries. Any insights which have been revealed must be treated as tentative for the general area investigated in this study is highly complex, and hence additional work and more country studies are required before any general conclusions can be drawn.

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APPENDIX A

BRAZIL
(Millions of Cruizeros)

	C_p	C_g	I	$T_{Exports}$	$T_{Imports}$	F
1950	189,200	27,400	34,700	25,000	21,100	NA
1951	234,400	31,800	46,300	33,000	41,000	NA
1952	265,700	39,100	56,300	26,000	40,000	NA
1953	315,200	49,000	61,000	32,000	28,800	NA
1954	395,400	57,000	83,700	43,000	49,600	NA
1955	480,200	94,000	99,200	55,000	56,300	NA
1956	613,300	130,400	117,000	60,000	62,800	NA
1957	714,000	152,700	137,900	61,000	81,800	NA
1958	931,100	180,500	181,000	64,000	97,000	NA
1959	1,210,700	242,800	288,000	109,000	152,000	NA
1960	1,660,100	337,900	355,600	147,000	202,900	20,000
1961	2,750,000	540,000	700,000	245,000	310,000	20,000
1962	4,540,000	840,000	1,190,000	307,000	450,000	60,000
1963	8,160,000	1,600,000	2,100,000	550,000	1,210,000	70,000
1964	15,600,000	2,930,000	3,810,000	1,178,000	1,480,000	150,000
1965	24,890,000	4,230,000	5,410,000	2,215,000	2,310,000	390,000
1966	38,840,000	6,260,000	8,200,000	2,880,000	3,630,000	500,000
1967	52,210,000	8,490,000	10,330,000	3,301,000	4,790,000	787,000
1968	71,920,000	11,430,000	16,520,000	4,829,000	7,560,000	922,000
1969	95,600,000	15,500,000	21,900,000	7,752,000	10,000,000	1,234,000
1970	143,427,000	20,512,000	43,441,000	10,728,000	14,476,000	1,842,000
1971	192,366,000	26,779,000	59,608,000	14,153,000	21,164,000	2,459,000

APPENDIX A--Continued

	GNP	GDP	Y_d	X_{Iron}	$V_{n\text{-}Iron}$	$X_{n\text{-}Iron}$
1950	255,200	255,200	249,520	100	255,100	24,900
1951	304,500	304,500	296,262	200	304,300	32,800
1952	347,100	347,100	336,929	400	347,100	25,600
1953	428,400	428,400	415,200	500	427,900	31,500
1954	529,500	529,500	511,701	400	529,100	42,600
1955	672,100	672,100	649,344	1,200	670,900	53,800
1956	857,900	857,900	829,616	1,800	856,100	58,200
1957	983,800	983,800	951,776	2,600	981,200	58,400
1958	1,259,600	1,259,600	1,222,248	2,900	1,256,700	61,100
1959	1,698,500	1,698,500	1,643,726	4,300	1,694,200	104,700
1960	2,277,700	2,297,700	2,215,500	9,500	2,288,200	137,500
1961	3,905,000	3,925,000	3,821,300	15,500	3,909,500	229,500
1962	6,367,000	6,427,000	6,251,400	24,800	6,402,200	282,200
1963	11,130,000	11,200,000	10,887,100	38,400	11,161,600	511,600
1964	21,888,000	22,038,000	21,405,600	99,300	21,938,700	1,078,700
1965	34,045,000	34,435,000	33,022,400	190,600	34,244,400	2,024,400
1966	46,050,000	46,550,000	44,710,600	219,700	46,330,300	2,060,300
1967	68,754,000	69,541,000	67,204,300	273,300	69,267,700	3,027,700
1968	96,217,000	97,139,000	94,043,900	349,700	96,789,300	4,479,300
1969	129,518,000	130,752,000	125,754,300	598,500	130,153,500	7,153,500
1970	201,790,000	203,632,000	196,892,900	955,400	202,676,600	9,772,600
1971	269,282,000	271,741,000	262,778,800	1,247,800	270,493,200	12,904,200

APPENDIX A--Continued

	T_d	T_i	T_t	Defense	Education	Social Services
1950	5,680	12,098	17,778	6,344	NA	NA
1951	8,237	17,018	25,255	7,626	NA	NA
1952	10,170	17,646	27,816	9,256	NA	NA
1953	13,199	20,560	33,759	11,260	NA	NA
1954	17,798	25,192	42,990	13,458	NA	NA
1955	22,756	28,690	51,446	16,677	NA	NA
1956	28,283	36,514	64,797	26,236	NA	NA
1957	32,023	45,917	77,940	34,619	NA	NA
1958	37,351	64,646	139,349	40,802	NA	NA
1959	54,773	93,800	148,573	43,900	NA	NA
1960	62,200	134,600	196,800	54,800	18,000	10,500
1961	83,700	198,900	282,600	69,600	26,800	11,700
1962	115,600	328,500	444,100	114,500	49,400	22,700
1963	242,900	602,900	845,800	194,500	70,100	41,200
1964	482,400	1,235,300	1,717,700	388,500	161,500	68,400
1965	1,022,600	1,998,900	3,021,500	924,000	396,400	118,000
1966	1,339,400	3,424,100	4,763,500	1,156,600	456,500	203,200
1967	1,549,700	3,476,800	5,062,500	2,065,900	587,400	248,300
1968	2,173,100	7,778,500	9,951,600	2,574,100	824,100	293,100
1969	3,763,700	10,637,200	14,400,900	3,492,400	1,150,100	300,000
1970	4,897,100	13,631,400	18,528,500	3,926,100	1,337,100	313,100
1971	6,503,200	18,450,500	24,953,700	6,497,500	1,528,800	368,500

Source: C_p, C_g, I

1950-1954 U.N., Yearbook of National Accounts Statistics, 1957.
1955-1960 U.N., Yearbook of National Accounts Statistics, 1964.
1961-1968 U.N., Yearbook of National Accounts Statistics, 1970.
1969 U.N., Yearbook of National Accounts Statistics, 1973.
1970-1972 IMF, International Financial Statistics, April 1975.

$T_{Exports}$

1950-1971 IMF, International Financial Statistics, 1972. Supplement, Vol. 5.
1972 IMF, International Financial Statistics, April 1975.

$T_{Imports}$

U.N., Yearbook of National Accounts, 1957.
$T_{Imports}$ unavailable for 1950 but Net Trade 3,900 and T_{Export} = 25,000, therefore $T_{Imports}$ 21,000
1951-1955 U.N., Yearbook of National Accounts, 1958.
1956-1960 U.N., Yearbook of National Accounts, 1964.
1961-1968 U.N., Yearbook of National Accounts, 1970.
1969 U.N., Yearbook of National Accounts, 1973.
1970-1971 IMF, International Financial Statistics, Feb., 1974.

Net Factor Payments Abroad

1950-1969 IMF, International Financial Statistics, 1972 Supplement.
1970-1972 IMF, International Financial Statistics, April 1975.

X_{Iron}

1950-1971 IMF, International Financial Statistics, 1972 Supplement, Vol. 25.

Taxes

1950-1955 U.N., Statistical Yearbook, 1955.
1956-1959 U.N., Statistical Yearbook, 1960.
1960-1963 U.N., Statistical Yearbook, 1966.
1964-1967 U.N., Statistical Yearbook, 1970.
1968-1971 U.N., Statistical Yearbook, 1974.

Defense, Education, and Social Services

1950-1955 U.N., Statistical Yearbook, 1955.
1956-1959 U.N., Statistical Yearbook, 1960.
1960-1963 U.N., Statistical Yearbook, 1966.
1964-1967 U.N., Statistical Yearbook, 1970.
1968-1971 U.N., Statistical Yearbook, 1974.

NA indicates unavailable data.

APPENDIX B

BRAZIL

	Consumer Price Index (1963 = 100)	Population (In Thousands)
1950	4	51,944
1951	4	53,495
1952	5	55,096
1953	6	56,741
1954	7	58,437
1955	9	60,183
1956	11	61,981
1957	13	63,833
1958	15	65,740
1959	20	67,704
1960	27	69,730
1961	38	71,868
1962	58	74,096
1963	100	76,409
1964	187	78,809
1965	303	81,301
1966	444	83,340
1967	575	85,750
1968	714	88,220
1969	880	90,770
1970	1,048	93,390
1971	1,269	96,080

Source: IMF, International Financial Statistics, 1972 Supplement, for consumer price index figures. Population Figures:
1950-1965--U.N., Demographic Yearbook, Special Topic Natality Statistics, 1963.
1966-1971--U.N., Demographic Yearbook, Special Topic Population Census Statistics, 1972.

APPENDIX C

CHILE
(Millions of Escudos)

	C_p	C_g	I	$T_{Exports}$	$T_{Imports}$	F
1950	121,586	17,929	14,266	20,394	14,165	3,000
1951	152,338	21,688	18,925	34,540	22,803	4,000
1952	203,369	32,803	24,673	58,220	28,313	4,000
1953	262,421	41,298	32,335	90,140	29,846	3,000
1954	451,369	67,739	46,634	126,990	40,581	5,000
1955	832,400	106,800	86,800	299,010	80,100	14,000
1956	1,306,000	161,900	138,300	326,550	158,000	35,000
1957	1,893,000	222,400	247,000	354,140	316,000	34,000
1958	2,420,000	309,800	309,900	435,140	333,700	36,000
1959	3,324,000	432,600	405,000	541,000	496,900	82,000
1960	4,037,000	510,700	513,000	582,300	690,900	79,000
1961	4,440,000	552,000	720,000	568,000	765,000	81,000
1962	5,179,000	761,000	812,000	671,000	745,000	104,000
1963	7,817,000	975,000	1,275,000	1,143,000	1,217,000	168,000
1964	9,374,000	1,266,000	2,111,000	1,644,000	1,763,000	250,000
1965	12,563,000	1,993,000	2,859,000	2,515,000	2,369,000	409,000
1966	17,325,000	2,953,000	3,793,000	3,894,000	3,594,000	731,000
1967	23,518,000	3,824,000	4,761,000	4,931,000	4,464,000	1,067,000
1968	31,510,000	5,251,000	6,711,000	6,649,000	6,261,000	1,401,000
1969	44,291,000	7,321,000	9,323,000	10,339,000	9,003,000	2,094,000
1970	64,031,000	12,613,000	13,818,000	14,591,000	14,358,000	1,874,000

APPENDIX C--Continued

	GNP	GDP	Y_d	X_{Copper}	$V_{n\text{-}Copper}$	$X_{n\text{-}Copper}$
1950	157,010	160,010	151,691	10,193	149,816	10,200
1951	200,690	204,690	193,267	15,545	189,144	18,996
1952	286,753	290,753	277,007	35,793	254,959	22,427
1953	393,350	396,350	382,371	53,023	343,326	37,118
1954	647,151	652,151	624,879	75,739	576,411	51,250
1955	1,230,913	1,244,913	1,185,891	202,918	1,041,994	96,094
1956	1,739,751	1,774,751	1,655,851	235,931	1,538,819	90,619
1957	2,366,545	2,400,545	2,255,645	231,532	2,169,013	122,613
1958	3,105,438	3,141,438	2,972,438	272,384	2,869,054	162,754
1959	4,123,700	4,205,700	3,918,200	356,651	3,849,048	184,348
1960	4,873,100	4,952,100	4,631,300	360,885	4,591,215	221,415
1961	5,434,000	5,515,000	5,162,700	354,165	5,160,835	213,835
1962	6,574,000	6,678,000	6,242,300	602,044	6,075,956	68,956
1963	9,825,000	9,993,000	9,353,400	813,130	9,179,870	329,870
1964	12,382,000	12,632,000	11,590,500	1,186,920	11,445,080	457,080
1965	17,152,000	17,561,000	15,788,500	1,738,817	15,822,183	776,183
1966	23,640,000	24,371,000	21,522,100	3,010,056	21,360,944	883,944
1967	31,503,000	32,570,000	28,791,500	4,114,953	28,455,047	816,057
1968	42,459,000	43,860,000	39,024,100	5,590,663	38,269,337	1,058,337
1969	60,177,000	62,271,000	55,109,000	9,710,540	53,660,460	628,460
1970	88,821,000	90,695,000	81,156,000	11,132,969	79,562,031	3,458,031

APPENDIX C--Continued

	T_d	T_i	T_t	Defense	Education	Social Services
1950	5,318	10,338	15,656	3,699	3,042	1,773
1951	7,422	16,008	23,430	4,495	3,904	2,728
1952	9,745	20,570	30,315	5,977	5,790	4,295
1953	10,978	25,890	36,869	7,181	7,422	6,156
1954	22,272	38,295	60,567	13,962	9,405	6,490
1955	45,021	70,925	115,947	28,970	14,080	11,062
1956	83,900	104,000	187,900	51,700	39,400	18,200
1957	110,900	168,500	279,400	73,100	54,500	30,100
1958	133,000	213,900	346,900	82,200	75,700	34,300
1959	205,500	330,800	536,300	91,100	111,700	73,400
1960	241,800	426,800	668,600	109,000	119,100	86,100
1961	271,300	486,800	758,100	119,300	133,900	94,300
1962	331,700	568,300	900,000	144,100	171,300	115,200
1963	471,600	811,400	1,283,000	178,500	232,600	191,500
1964	791,500	1,146,500	1,938,000	255,900	359,000	161,100
1965	1,363,400	1,746,000	3,109,500	390,000	560,000	452,000
1966	2,117,900	2,506,700	4,624,600	541,500	881,200	494,400
1967	2,711,500	3,339,600	6,051,100	681,100	1,174,200	608,100
1968	3,434,900	4,932,100	8,367,000	917,000	1,654,200	770,700
1969	5,068,000	7,420,500	12,488,500	1,318,800	2,418,800	1,069,400
1970	7,664,400	10,652,400	18,316,800	2,404,700	3,841,800	1,693,400

Source: C_p, C_g, I

1950-1954 U.N., Yearbook of National Accounts Statistics, 1957.
1955-1963 U.N., Yearbook of National Accounts Statistics, 1964.
1964-1969 U.N., Yearbook of National Accounts Statistics, 1970.
1970-1972 U.N., Yearbook of National Accounts Statistics, 1973.

$T_{Exports}$ and $T_{Imports}$

1950-1954 U.N., Yearbook of National Accounts Statistics, 1957.
1955-1963 U.N., Yearbook of National Accounts Statistics, 1964.
1964-1969 U.N., Yearbook of National Accounts Statistics, 1970.
1970-1972 U.N., Yearbook of National Accounts Statistics, 1973.

Net Factor Payment Abroad

1948-1970 IMF, International Financial Statistics, 1972 Supplement.

X_{Copper}

1948-1950 U.N., Yearbook of International Trade Statistics, 1951.
1951 U.N., Yearbook of International Trade Statistics, 1952.
1952-1954 U.N., Yearbook of International Trade Statistics, 1955.
1955-1958 U.N., Yearbook of International Trade Statistics, 1958, Vol. 1.
1958-1970 IMF, International Financial Statistics, 1972 Supplement, Vol. 25.

Figures were in U.S. million of $ and were converted to million pesos with exchange rate given in same source.
1950-1957 were in million peso de 6d ore and conversion rate 20.6 U.S. cents per peso de 6d oro. Thus, figures were divided by 4.854369 and then multiplied by exchange rate for each year.

Taxes

1948-1949 U.N., Statistical Yearbook, 1951.
1950-1954 U.N., Statistical Yearbook, 1955.
1955 U.N., Statistical Yearbook, 1956.
1956-1959 U.N., Statistical Yearbook, 1960.
1960-1961 U.N., Statistical Yearbook, 1964.
1962-1965 U.N., Statistical Yearbook, 1966.

1966 U.N., Statistical Yearbook, 1970.
1967-1973 U.N., Statistical Yearbook, 1974.

Defense, Education, and Social Services
1950-1954 U.N., Statistical Yearbook, 1955.
1955 U.N., Statistical Yearbook, 1956.
1956-1959 U.N., Statistical Yearbook, 1960.
1960-1961 U.N., Statistical Yearbook, 1964.
1962-1965 U.N., Statistical Yearbook, 1966.
1966 U.N., Statistical Yearbook, 1970.
1967-1973 U.N., Statistical Yearbook, 1974.

*Chile changed currency to escudoes in 1960. Thus, figures from 1960-1973 were converted again to pesos. Escudo equal to 1,000 pesos.

T
Exports
1950-1958 were in million pesos 6 de ore, thus divide by 4.854369 and then multiply by exchange rate.

APPENDIX D

CHILE

	Consumer Price Index (1963 = 100)	Population (In Thousands)
1950	3	6,073
1951	3	6,185
1952	4	6,303
1953	5	6,462
1954	8	6,624
1955	15	6,79[illegible]
1956	23	6,692
1957	29	7,137
1958	37	7,316
1959	51	7,500
1960	57	7,968
1961	61	7,858
1962	69	8,029
1963	100	8,217
1964	146	8,492
1965	188	8,567
1966	231	8,922
1967	273	9,137
1968	345	9,351
1969	451	9,566
1970	598	8,860

Source: IMF, International Financial Statistics, 1972 Supplement, for consumer price index. Population figures:
1950-1965--U.N., Demographic Yearbook, Special Topic Natality Statistics, 1965.
1966-1969--U.N., Demographic Yearbook, Special Topic Natality Statistics, 1969.
1970 --U.N., Demographic Yearbook, Special Topic Population Census Statistics, 1972.

APPENDIX E

MEXICO
(Millions of Pesos)

	C_p	C_g	I	$T_{Exports}$	$T_{Imports}$	F	GNP	GDP	Y_d
1952	46,929	3,394	8,166	8,773	8,965	700	57,597	58,297	56,148
1953	46,275	3,455	7,540	8,366	9,119	500	56,017	56,017	57,871
1954	50,659	3,426	9,428	11,411	11,705	700	62,519	63,219	61,226
1955	65,018	3,306	11,829	16,282	14,880	900	80,655	81,555	78,669
1956	73,908	3,972	13,735	18,075	18,153	1,300	90,237	91,537	87,650
1957	93,300	5,200	19,200	15,200	17,300	1,300	114,300	115,600	111,520
1958	105,300	5,900	18,900	15,300	17,000	1,400	127,000	128,400	124,192
1959	112,000	6,200	19,600	15,900	16,000	1,500	136,200	137,700	133,128
1960	126,400	8,000	23,200	16,600	18,300	1,800	154,100	155,900	150,451
1961	133,300	8,600	24,100	17,800	18,100	1,900	163,800	165,700	159,723
1962	144,400	9,600	24,800	19,400	18,300	2,300	177,600	179,900	172,874
1963	155,000	10,700	28,000	20,900	19,800	2,600	192,200	194,800	198,179
1964	180,700	12,500	36,600	22,400	25,600	3,400	223,200	226,600	217,193
1965	194,300	13,800	39,000	24,700	25,600	1,500	244,700	246,200	237,141
1966	215,100	16,100	45,500	26,900	27,300	1,800	274,500	276,300	265,808
1967	238,600	17,700	52,900	27,000	29,800	2,100	304,300	306,400	294,768
1968	253,200	25,900	65,700	28,300	33,900	6,300	332,900	339,200	322,435
1969	277,000	28,800	72,500	32,700	36,100	NA	374,900	374,900	362,980
1970	318,700	31,600	81,100	34,200	42,400	NA	423,200	423,200	410,232

APPENDIX E--Continued

	X_{Lead}	$V_{n\text{-}Lead}$	$X_{n\text{-}Lead}$	T_d	T_i	T_t	Defense	Education	Social Services
1952	657	57,640	8,116	1,448	3,031	4,479	434	459	172
1953	507	55,510	7,859	1,145	2,891	4,037	479	507	185
1954	658	62,561	10,753	1,292	3,504	4,797	404	691	229
1955	722	80,833	15,560	1,985	4,769	6,755	533	767	547
1956	667	90,870	17,408	2,587	4,959	7,546	631	932	653
1957	603	114,997	14,597	2,779	4,638	7,417	791	1,040	806
1958	439	127,961	14,861	2,808	5,694	8,502	861	1,278	940
1959	424	137,276	15,476	3,071	6,021	6,092	882	1,497	1,057
1960	420	155,480	16,180	3,648	10,733	14,381	1,021	1,945	1,466
1961	465	165,235	17,335	4,076	6,655	10,731	1,111	2,186	1,489
1962	328	179,572	19,072	4,725	7,287	12,013	1,257	2,500	1,762
1963	345	194,455	20,555	5,979	7,775	13,755	1,387	2,856	2,038
1964	296	226,304	22,104	6,007	7,129	13,136	1,624	3,768	2,124
1965	351	245,849	24,349	7,559	8,012	15,571	1,909	4,182	2,773
1966	345	275,955	26,555	8,691	11,998	20,690	1,788	4,659	2,910
1967	300	306,100	26,700	9,532	9,743	19,275	2,147	5,294	3,038
1968	283	338,917	28,017	10,465	10,720	21,185	2,285	5,950	3,224
1969	285	374,615	32,415	11,920	11,485	23,405	2,548	6,726	3,535
1970	327	422,873	33,873	12,968	11,961	24,929	2,723	7,276	3,840

Sources: C_p, C_g, I, $T_{Exports}$, $T_{Imports}$

1952-1956	U.N., Yearbook of National Accounts Statistics, 1957.
1957-1963	U.N., Yearbook of National Accounts Statistics, 1964.
1964-1967	U.N., Yearbook of National Accounts Statistics, 1970.
1968-1970	U.N., Yearbook of National Accounts Statistics, 1973.
1971-1972	IMF, International Financial Statistics, Feb. 1974.

Net Factor Pay:

1950-1968	IMF, International Financial Statistics, 1972 Supplement.

X_{Lead}

1952-1971	IMF, International Financial Statistics, 1972 Supplement, Vol. 25.

Taxes

1952-1953	U.N., Statistical Yearbook, 1955.
1954	U.N., Statistical Yearbook, 1957.
1955-1958	U.N., Statistical Yearbook, 1960.
1959-1960	U.N., Statistical Yearbook, 1962.
1961-1965	U.N., Statistical Yearbook, 1966.
1966-1970	U.N., Statistical Yearbook, 1973.
1967-1970	Estimated.

Defense, Education, and Asocial Services

1952-1953	U.N., Statistical Yearbook, 1955.
1954	U.N., Statistical Yearbook, 1957.
1955-1958	U.N., Statistical Yearbook, 1960.
1959-1960	U.N., Statistical Yearbook, 1962.
1961-1965	U.N., Statistical Yearbook, 1966.
1966	U.N., Statistical Yearbook, 1973.

NA indicates unavailable data.

APPENDIX F

MEXICO

	Consumer Price Index (1963 = 100)	Population (In Thousands)
1952	60.8	27,415
1953	59.8	28,253
1954	62.7	29,118
1955	72.7	30,015
1956	76.0	30,942
1957	80.1	31,902
1958	89.9	32,895
1959	92.1	33,924
1960	96.6	34,988
1961	98.3	36,091
1962	99.4	37,233
1963	100.0	38,416
1964	102.2	39,643
1965	105.9	40,913
1966	110.5	42,790
1967	113.8	44,270
1968	116.4	45,810
1969	120.1	47,420
1970	125.7	49,090

Source: IMF, International Financial Statistics, 1972 Supplement, for consumer price index figures.
Population Figures:
1950-1965--U.N., Demographic Yearbook, Special Topic Natality Statistics, 1965.
1966-1970--U.N., Demographic Yearbook, Special Topic Population Census Statistics, 1972.

APPENDIX G

VENEZUELA
(Millions of Bolivares)

	C_p	C_g	I	$T_{Exports}$	$T_{Imports}$	F	GNP	GDP	Y_d
1950	6,175	1,209	2,604	3,619	3,908	1,270	8,429	9,699	7,957
1951	6,515	1,358	2,972	4,182	4,195	1,380	9,452	10,832	8,992
1952	7,587	1,438	3,051	4,512	3,406	1,450	11,732	13,182	11,147
1953	8,493	1,500	3,034	4,709	3,644	1,460	12,632	14,092	11,966
1954	9,685	1,648	3,022	5,197	3,873	1,610	14,069	15,679	13,310
1955	9,943	1,791	3,634	5,914	4,085	1,910	15,287	17,197	14,548
1956	11,199	1,920	4,162	6,905	5,058	2,470	16,658	19,128	15,743
1957	12,179	2,321	6,064	8,521	6,955	3,250	18,880	20,980	17,762
1958	16,482	2,916	4,727	7,288	7,205	2,100	22,108	24,208	20.798
1959	14,603	3,130	6,060	7,803	6,324	1,890	23,382	25,272	21,351
1960	14,018	3,544	4,797	8,112	4,838	2,100	23,533	25,633	21,713
1961	14,156	3,644	4,286	8,628	5,163	2,320	23,232	25,542	21,586
1962	15,457	3,528	4,635	9,145	5,747	2,730	24,288	27,018	22,092
1963	16,357	4,063	4,849	9,490	5,464	2,850	26,445	29,295	23,941
1964	19,526	4,228	6,272	11,382	7,071	3,220	31,047	34,267	28,065
1965	21,689	4,682	6,974	11,648	7,996	3,490	33,507	36,997	30,262
1966	22,731	5,116	7,431	11,282	7,502	3,390	35,660	39,058	31,995
1967	23,793	5,431	7,930	11,976	8,024	3,270	37,836	41,106	33,644
1968	25,793	5,926	9,382	12,134	9,621	3,320	40,294	43,614	36,930
1969	27,859	6,274	9,606	12,106	9,778	3,130	42,937	46,067	38,797
1970	25,960	6,900	10,670	12,760	10,370	2,590	43,330	45,920	38,727
1971	28,140	8,260	12,330	14,920	11,780	3,200	48,670	51,870	42,040

APPENDIX G--Continued

	$X_{Petroleum}$	$V_{n-Petroleum}$	$X_{n-Petroleum}$	T_d	T_i	T_t	Defense	Education	Social Services
1950	3,356	3,343	263	471	1,238	1,709	175	126	127
1951	3,798	7,034	384	459	1,474	1,934	188	132	140
1952	4,208	8,974	304	584	1,523	2,107	212	139	146
1953	4,398	9,694	311	665	1,513	2,178	211	136	157
1954	4,797	10,882	400	759	1,695	2,454	207	144	163
1955	5,491	11,706	423	739	1,998	2,737	332	232	NA
1956	6,349	12,779	556	914	2,185	3,099	343	219	NA
1957	7,865	13,115	656	1,117	4,310	5,428	419	243	NA
1958	7,099	17,109	189	1,309	3,455	4,765	572	276	NA
1959	6,654	18,618	1,149	2,031	3,125	5,156	630	527	NA
1960	6,642	18,991	1,470	1,820	2,987	4,807	585	687	1,017
1961	6,809	18,733	1,819	1,646	3,324[a]	4,970	572[a]	778[a]	1,234[a]
1962	7,221	19,797	1,924	2,196	3,479	5,675	509	610	1,020
1963	7,218	22,077	2,272	2,504	3,854	6,358	613	652	1,088
1964	10,138	24,129	1,244	2,982	3,888	6,870	650	784	1,295
1965	10,144	26,853	1,504	3,245	3,713	6,958	742	923	1,499
1966	9,746	29,312	1,536	3,673	3,760	7,433	796	1,014	1,617
1967	10,266	30,840	1,710	4,192	3,964	8,156	890	1,179	1,840
1968	10,364	33,250	1,770	4,364	4,046	8,410	894	1,253	2,012
1969	10,145	35,922	1,961	4,140	4,122	8,265	867	1,385	2,213
1970	10,549	35,371	2,211	4,603	4,412	9,015	891	1,702	2,411
1971	12,691	39,179	2,229	6,630	4,545	11,175	1,113	1,929	2,374

Source: C_p, C_g, I, $T_{Exports}$, $T_{Imports}$

1950-1951	IMF, International Financial Statistics, January 1961
1952-1958	U.N., Yearbook of National Accounts, 1959, Published 1960.
1959-1963	U.N., Yearbook of National Accounts, 1964.
1964-1969	U.N., Yearbook of National Accounts, 1970.
1970-1971	U.N., Yearbook of National Accounts, February 1974.

Net Factor Payments:

1950-1971	IMF, International Financial Statistics, April 1975.

$X_{Petroleum}$

1950-1971	IMF, International Financial Statistics, 1972 Supplement, Vol. 25.

Taxes

1950	U.N., Statistical Yearbook, 1953.
1951-1954	U.N., Statistical Yearbook, 1955.
1955-1959	U.N., Statistical Yearbook, 1960.
1960-1964	U.N., Statistical Yearbook, 1966.
1965-1967	U.N., Statistical Yearbook, 1970.
1968-1971	U.N., Statistical Yearbook, 1974.

Defense, Education and Social Services

1950	U.N., Statistical Yearbook, 1953
1951-1954	U.N., Statistical Yearbook, 1955.
1955-1959	U.N., Statistical Yearbook, 1960.
1960-1964	U.N., Statistical Yearbook, 1966.
1965-1967	U.N., Statistical Yearbook, 1970.
1968-1971	U.N., Statistical Yearbook, 1974.

[a]Data for 1961 was July 31-Dec. 1961, therefore doubled figures to make it on a yearly basis.

NA indicates unavailable data.

APPENDIX H

VENEZUELA

	Consumer Price Index (1963 = 100)	Population (In Thousands)
1950	85.1	4,976
1951	91.1	5,179
1952	92.2	5,422
1953	91.0	5,665
1954	91.1	5,908
1955	90.7	6,150
1956	91.5	6,393
1957	89.6	6,636
1958	94.0	6,879
1959	98.7	7,122
1960	102.0	7,364
1961	99.3	7,612
1962	98.9	7,872
1963	100.0	8,144
1964	102.1	8,427
1965	103.9	8,722
1966	105.6	9,030
1967	105.7	9,350
1968	107.1	9,690
1969	109.7	10,040
1970	112.4	10,400
1971	116.1	10,780

Source: IMF, International Financial Statistics, 1972 Supplement for consumer price index. Population Figures:
1950-1965--U.N., Demographic Yearbook, Special Topic Natality Statistics, 1965.
1966-1971--U.N., Demographic Yearbook, Special Topic Population Census Statistics, 1972.

APPENDIX I

SUMMARY RESULTS OF THE STATISTICAL ANALYSIS FOR THE DIRECT IMPACT MODEL

Endogeneous Variables	Exogeneous Variables	Beta Coefficients	R^2
	BRAZIL		
C_p	X_{lead}	154.72	0.99221
C_g		22.15	0.98036
I		45.72	0.98967
M		16.42	0.99038
$X_{n\text{-}iron}$		10.50	0.99454
T_d		5.32	0.99281
T_i		15.10	0.98051
Defense		5.01	0.96553
Education		1.55	0.92529
Health		0.35	0.74530
	CHILE		
C_p	X_{copper}	5.21	0.98046
C_g		0.96	0.95957
I		1.13	0.97778
M		1.13	0.97117

Endogeneous Variables	Exogeneous Variables	Beta Coefficients	R^2
$X_{n\text{-copper}}$		8.46	0.69422
T_d		0.62	0.97930
T_i		0.82	0.98597
Defense		0.17	0.94560
Education		0.30	0.97400
Social Services including Health		0.13	0.96039
	MEXICO		
C_p	X_{lead}	-458.26	0.68511
C_g		-147.24	0.11656
I		-372.10	0.11838
M		-173.48	0.10794
$X_{n\text{-lead}}$		-37.59	0.55262
T_d		-19.68	0.60932
T_i		-16.01	0.61059
Defense		-4.17	0.69162
Education		-11.94	0.63860
Social Services including Health		-6.82	0.71120
	VENEZUELA		
C_p		2.60	0.92469
C_g		0.72	0.88070
I		0.98	0.87027
M		0.86	0.87648
$X_{n\text{-petroleum}}$	$X_{petroleum}$	0.22	0.58069

Endogeneous Variables	Exogeneous Variables	Beta Coefficients	R^2
T_d		0.61	0.88067
T_i		0.38	0.83217
Defense		0.10	0.90652
Education		0.19	0.81509
Social Services including Health		0.30	0.90670

APPENDIX J

SUMMARY RESULTS OF THE STATISTICAL ANALYSIS FOR THE INDIRECT IMPACT MODELS

Endogenous Variables	Exogenous Variables	Beta Coefficients	R^2 for Regression Equations	Square Semi-Partial Correlation for Exports
		BRAZIL		
C_p	Y_d	0.84	0.99914	
	X_{iron}	-22.25		0.00011
C_g	T_t	0.95	0.99157	
	X_{iron}	2.79		0.01121
I	Y	0.05	0.98994	
	X_{iron}	39.19		0.00303
M	Y	0.09	0.99744	
	X_{iron}	-2.80		0.00015
$X_{n\text{-}iron}$	$V_{n\text{-}iron}$	0.03	0.99639	
	X_{iron}	4.26		0.00185
T_d	Y	0.01	0.99409	
	X_{iron}	2.67		0.00129
T_i	M	0.96	0.99088	
	X_{iron}	-0.66		0.00002
Defense	Population	0.001	0.96905	
	X_{iron}	4.62		0.31705

Endogenous Variables	Exogenous Variables	Beta Coefficients	R^2 for Regression Equations	Square Semi-Partial Correlation for Exports
Education	Y	0.01	0.96510	
	X_{iron}	-1.35		0.00487
Health	Y	0.01	0.89474	
	X_{iron}	-1.57		0.08908
V_{n-iron}	I_{t-1}	0.53	0.99489	
	X_{iron}	192.40		0.00811
		CHILE		
C_p	Y_d	0.77	0.99980	
	X_{copper}	0.16		0.00002
C_g	T_t	1.03	0.99907	
	X_{copper}	-0.57		0.95957
I	Population	0.104	0.99582	
	X_{copper}	0.08		0.42898
M	Population	-0.003	0.99682	
	X_{copper}	-1.13		0.46343
$X_{n-copper}$	$V_{n-copper}$	0.13	0.95622	
	X_{copper}	-0.61		0.69422
T_d	Population	0.0003	0.97930	
	X_{copper}	0.62		0.46160
T_i	M	0.53	0.99948	
	X_{copper}	0.28		0.00292
Defense	Population	-0.003	0.94705	
	X_{copper}	0.18		0.48237
Education	Population	-0.005	0.97524	
	X_{copper}	0.32		0.49329

Endogenous Variables	Exogenous Variables	Beta Coefficients	R^2 for Regression Equations	Square Semi-Partial Correlation for Exports
Social Services	Population	0.002	0.96217	
	X_{copper}	0.13		0.41121
$V_{n\text{-}copper}$	I_{t-1}	5.50	0.99884	
	X_{copper}	0.21		0.00002
		MEXICO		
C_p	Y_d	0.74	0.99784	
	X_{lead}	-24.31		0.00065
C_g	T_t	5.58	0.24793	
	X_{lead}	51.09		0.11656
I	Y	0.99	0.28085	
	X_{lead}	227.17		0.01527
M	Y	0.48	0.26573	
	X_{lead}	114.87		0.01638
$X_{n\text{-}lead}$	$V_{n\text{-}lead}$	0.07	0.95281	
	X_{lead}	6.91		0.55262
T_d	Y	0.03	0.99025	
	X_{lead}	1.71		0.00160
T_i	M	0.01	0.63892	
	X_{lead}	14.81		0.46611
Defense	Y	0.01	1.00	
	X_{lead}	2.85		0.0
Education	Y	0.10	1.00	
	Y_{t-1}	-0.07		
	X_{lead}	-0.82		0.0

Endogenous Variables	Exogenous Variables	Beta Coefficients	R^2 for Regression Equations	Square Semi-Partial Correlation for Exports
Social Services	Population	0.00002	0.99125	
	X_{lead}	0.06		0.00002
V_{n-lead}	I_{t-1}	0.18	0.71998	
	X_{lead}	-540.87		0.45924
		VENEZUELA		
C_p	Y_d	0.67	0.99025	
	$X_{petroleum}$	0.05		0.00003
C_g	T_t	0.91	0.95883	
	$X_{petroleum}$	-0.19		0.88070
I	Y	0.19	0.91968	
	$X_{petroleum}$	0.12		0.00094
M	Population	-0.0001	0.99236	
	Y	0.21		
	$X_{petroleum}$	0.57		0.00094
$X_{n-petroleum}$	$V_{n-petroleum}$	0.09	0.74188	
	$X_{petroleum}$	-0.14		0.58069
T_d	Y	0.15	0.95527	
	$X_{petroleum}$	-0.04		0.00029
T_i	M	0.02	0.83247	
	$X_{petroleum}$	0.36		0.09264
Defense	Y	0.02	0.96110	
	$X_{petroleum}$	0.01		0.00061
Education	Y	0.06	0.95213	
	$X_{petroleum}$	-0.09		0.01438

Endogenous Variables	Exogenous Variables	Beta Coefficients	R^2 for Regression Equations	Square Semi-Partial Correlation for Exports
Social Services	Population	0.00001	0.92883	
	$X_{petroleum}$	0.23		0.33299
$V_{n-petroleum}$	I_{t-1}	1.64	0.93228	
	$X_{petroleum}$	2.15		0.03878